

$O(1)$

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

<Key, value>
↓
unique



APNA
COLLEGE

⏮ ⏪ ⏩ ⏭ 🔊 2:07 / 58:18



Apna College ✓
5.49M subscribers

Subscribe

👍 4.9K

 Share

...

Apna College - 36 / 39

Placement  Windows
Go to Settings to activate Windows.

YouTube

Search

Q

9+

Implementation HashMap

0(1)
put()
get()
containsKey()
remove()
size()
keySet()

arr of int

10	1	2	2
----	---	---	---

Array of dd

country, population

"India"	190
"China"	200
"US"	100
"Nyal"	5
"Canada"	50
"Bangladesh"	5

N=4

0 1 2 3

0 1 2 3

APNA COLLEGE

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Implementation HashMap

0(1)
put()
get()
containsKey()
remove()
size()
keySet()

country, population
key value

"India"	190
"China"	200
"US"	100
"Nepal"	5
"Canada"	50
"Bangladesh"	5

(0) (1) (2) (3) N=4

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

YouTube

Search

Q

9+

Implementation HashMap

0(1)
put()
get()
containsKey()
remove()
size()
keySet()

country, population
key value

"India"	190
"China"	200
"US"	100
"Nepal"	5
"Canada"	50
"Bangladesh"	5

(0) (1) (2) (3) N=4

"India" 190
"China" 200
"US" 100
"Nepal" 5
"Canada" 50
"Bangladesh" 5

APNA COLLEGE

5:34 / 15:18

MAP

CC

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

YouTube

Search

Q

9+

Implementation HashMap

O(1)

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

"India"	190
"China"	200
"US"	100
"Nepal"	5
"Canada"	50
"Bangladesh"	5

country, population
key value

(0) (1) (2) (3) N=4

"India" 190

"China" 200

"US" 100

"Nepal" 5

"Canada" 50

"Bangladesh" 5

5:53 / 15:18

CC

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



YouTube

Search



Implementation HashMap

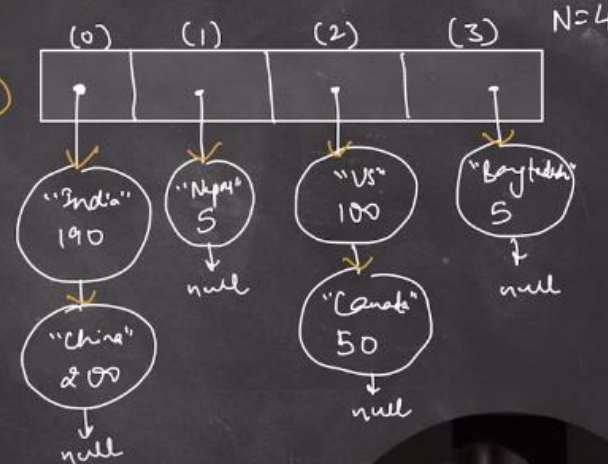
O(1)

put()
get()
containsKey()
remove()
size()
keySet()

key → country, population → value

"India"	190
"China"	200
"US"	100
"Nepal"	5
"Canada"	50
"Bangladesh"	5

① Array of 22



6:23 / 15:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



7:14 AM
7/2/2024



YouTube

Search

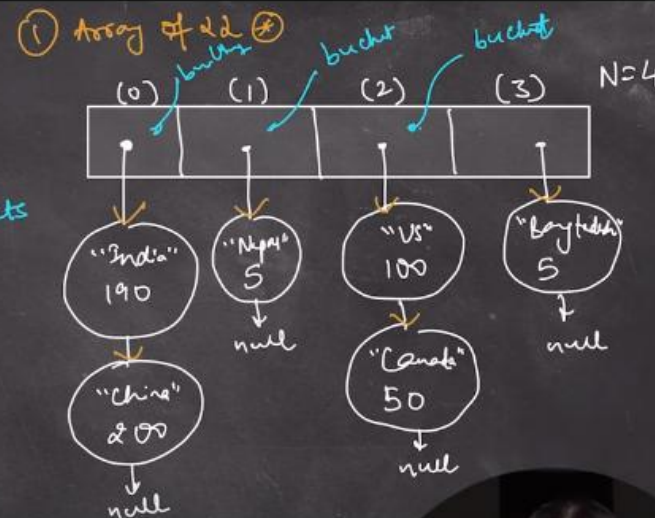


Implementation HashMap

O(1)

① put()
get()
containsKey()
remove()
size()
keySet()

n(nodes) = 6
N(size) = 4 = buckets



7:57 / 15:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



ENG

7:16 AM
7/2/2024



Implementation HashMap

0(1)

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

"Sridhar" 20

1 Array of 4

$n(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

$\text{put}(k, v)$

- exist → update
- doesn't exist → new k, v add

Array of 4 buckets:

- (0) → "India" 190 → "China" 200 → null
- (1) → "Nepal" 5 → null
- (2) → "US" 100 → "Canada" 50 → null
- (3) → "Bangladesh" 5 → null

Red circle around "Sridhar" 20

9:18 / 15:18

HASHMAP

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Search

$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

O(1)

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

put(K, V)

exist

doesn't exist

updates

new K, V add

hashing → data for change

"abc" → 3086

1234 → 389 "abd"

① Array of 42

N=4

(0)	(1)	(2)	(3)
India 190	Nepal 5	US 100	England 5
China 200	null	Canada 50	null
null			

10:24 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



YouTube

Search

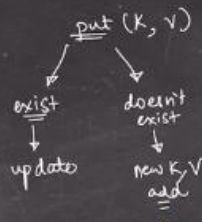


$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

O(1)

put()
get()
containsKey()
remove()
size()
keySet()



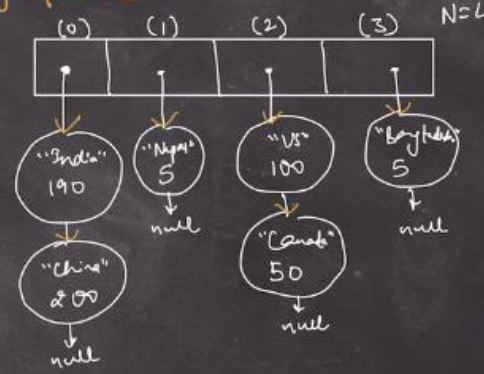
hashCode()

inp

hash function

out

① Array of 42



12:47 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe



4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



7:22 AM

7/2/2024





YouTube

Search

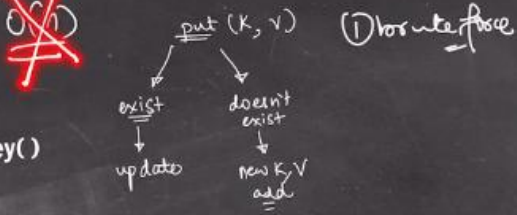


$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

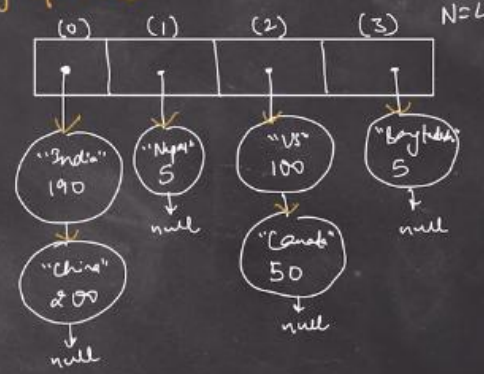
Implementation HashMap

0(1)

put()
get()
containsKey()
remove()
size()
keySet()



① Array of LL



HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



7:24 AM

7/2/2024



YouTube

Search

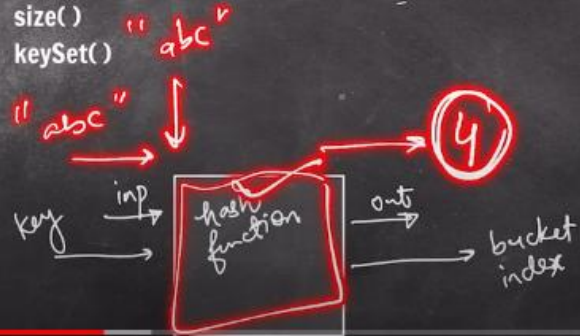
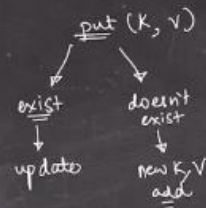


$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

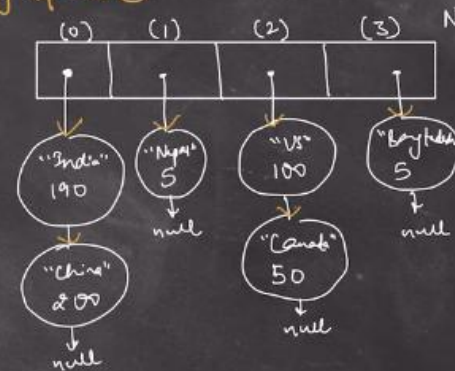
Implementation HashMap

O(1)

put()
get()
containsKey()
remove()
size()
keySet()



① Array of 42



14:20 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Type here to search



24°C



7:24 AM
7/2/2024



YouTube

Search



$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

0(1)

put()
get()
containsKey()
remove()
size()
keySet()



① Array of 42



15:08 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



ENG

7:25 AM

7/2/2024



YouTube

Search



$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

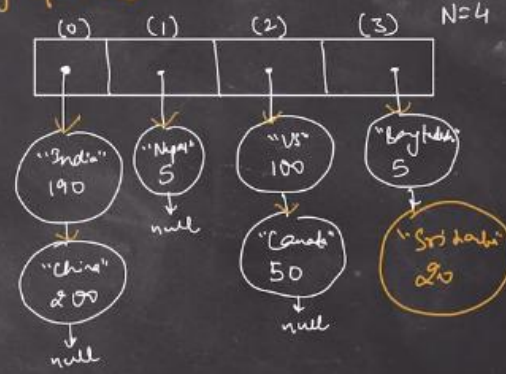
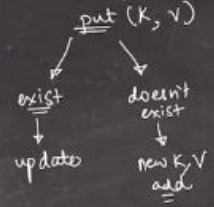
$O(\text{linked list size})$

① Array of LL

Implementation HashMap

$O(1)$

put()
get()
containsKey()
remove()
size()
keySet()



16:49 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



7:27 AM

7/2/2024

YouTube

Search

Q

9+

$m(\text{nodes}) = 6$

$N(\text{size}) = 4 = \text{buckets}$

Implementation

HashMap

$O(1)$

put()

get()

containsKey()

remove()

size()

keySet()

put (k, v)

exist

updater

doesn't exist

new K, V

add

$\lambda \leq K(\text{const. value})$

(threshold value)

$\frac{n}{N} = \lambda(\text{lambda})$

(1) Array of 42

(0) (1) (2) (3) N=4

"India" 190

"China" 200

"Japan" 5

null

"US" 100

"Canada" 50

"Brazil" 5

"Sri Lanka" 20

"Sri Lanka"

hash function

(0-n-1)

3

18:26

58:18

CC

Settings

Fullscreen

APNA COLLEGE

HashMap Implementation in Java | HashMap | Java with DSA

Apna College
5.49M subscribers

Subscribe

4.9K

Share

Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Windows taskbar: Search bar, Task View, Edge, File Explorer, Mail, Calendar, Photos, WhatsApp (29), Facebook, YouTube, OneDrive, Settings, Weather (24°C), Network, Volume, Language (ENG), Date/Time (7:28 AM 7/2/2024)



YouTube

Search



$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

$O(\text{linked list size})$

① Array of LL

Implementation HashMap

$O(1)$

$O(\lambda)$

put()

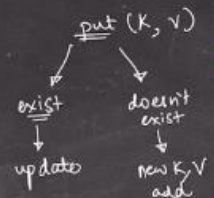
get()

containsKey()

remove()

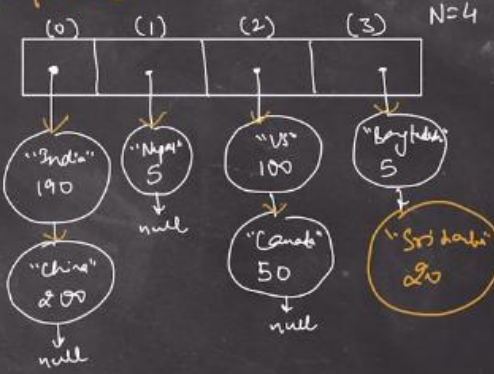
size()

keySet()



$\lambda \leq K$ (const. value)
(threshold value)

$$\frac{n}{N} = \lambda (\text{lambda})$$



18:42 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Type here to search



24°C



7:29 AM

7/2/2024

$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

$O(1)$
 $O(1)$
 $O(1)$
 $O(1)$
 $O(1)$
 $O(1)$

$\lambda \leq K$ (const. value)
 (threshold value)
 $\frac{n}{N} = \lambda$ (lambda)

put (K, V)
 exist → up dates
 doesn't exist → new K, V add

(0) (1) (2) (3) N=4

```

graph TD
    A["(0)"] --> B["India 190"]
    B --> C["China 200"]
    C --> D["null"]
    E["(1)"] --> F["Japan 5"]
    F --> G["null"]
    H["(2)"] --> I["US 100"]
    I --> J["Canada 50"]
    J --> K["null"]
    L["(3)"] --> M["England 5"]
    M --> N["Sri Lanka 20"]
    N --> O["null"]
    
```

"Sri Lanka" → hash function → (0-n-1) → 3

18:47 / 58:18

APNA COLLEGE

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

YouTube

Search

Q

9+

$m(\text{nodes}) = 6$

$N(\text{size}) = 4 = \text{buckets}$

Implementation

HashMap

$O(1)$

put()

get()

containsKey()

remove()

size()

keySet()

$O(\text{linked list size})$

$\lambda \leq K(\text{const. value})$
(threshold value)

$\frac{n}{N} = \lambda(\text{lambda})$

Array of 4

(0)

(1)

(2)

(3)

"India" 190

"China" 200

null

"Japan" 5

"US" 100

"Canada" 50

"Brazil" 5

"Sri Lanka" 20

"Sri Lanka"

hash function

$(0 - n - 1)$

3

19:09 / 58:18

CC

Settings

Fullscreen

HashMap Implementation in Java | HashMap | Java with DSA

Apna College
5.49M subscribers

Subscribe

4.9K

Share

Java & DSA Course for Placement

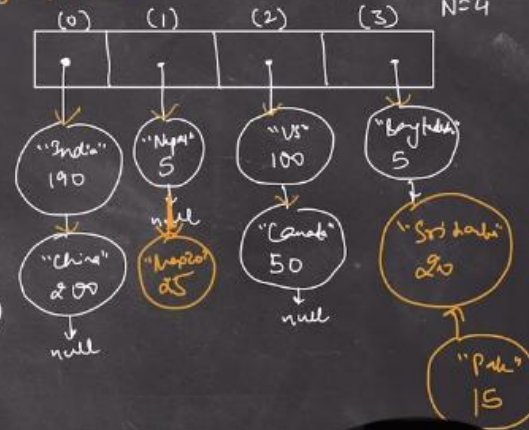
Apna College - 36 / 39

Go to Settings to activate Windows.

Windows taskbar: Search bar, Task View, Edge, File Explorer, Mail, Calendar, Photos, WhatsApp (29), Facebook, YouTube, OneDrive, Settings, Weather (24°C), Network, Volume, Language (ENG), Date/Time (7:29 AM 7/2/2024)

$N=4$

Refactoring



"Sri Lanka" → hash function → 3

⏮ ⏪ ⏩ ⏭ 🔊 20:52 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College ✓
5.49M subscribers

Subscribe

 4.9K

 Share

...

Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

 Type here to search

 24°C

^



) ENG

7:31 AM
7/2/2024



Implementation HashMap

$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$
 $O(\text{linked list size})$
 $N=8$

$O(1)$
put()
get()
containsKey()
remove()
size()
keySet()

Rehashing

Array of 4 elements

Bucket 0: "India" 190 → "China" 200 → null
Bucket 1: "Japan" 5 → "Korea" 25 → null
Bucket 2: "US" 100 → "Canada" 50 → null
Bucket 3: "England" 5 → "Sri Lanka" 20 → "Pakistan" 15

hash function: "Sri Lanka" → 3

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Search

$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

$O(1)$

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

$O(\text{linked list size})$

① Array of LL

$N=8$

Reshashing =

hash function

$(0-n-1)$

$\Rightarrow 190 \Rightarrow 19$

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe



4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Search

$m(\text{nodes}) = 6$
 $N(\text{size}) = 4 = \text{buckets}$

Implementation HashMap

$O(1)$

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

$\lambda = \frac{n}{N} = \frac{9}{8} = 1.125$
 $\lambda \leq K(2)$

Rehashing \rightarrow

Example: Sri Lanka \rightarrow hash function $\rightarrow 3$

$O(\text{linked list size})$

① Array of 22

$N=8$

$N=4$

23:38 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Implementation HashMap

O(1)

- put() ✓
- get()
- containsKey()
- remove()
- size()
- keySet()

$\lambda \leq K$

Array of 2d

$n = \text{nodes}$
 $N = 4$

(0) (1) (2) (3)

"India" 190
"China" 200
"Japan" 5
"Nepal" 5
"US" 100
"Canada" 50
"Bangladesh" 5
"Sri Lanka" 20
"Pakistan" 15

key → hash function → bit

HashMap Implementation in Java | HashMap | Java with DSA

Apna College 5.49M subscribers

Subscribe

4.9K

Share

Java & DSA Course for Placement

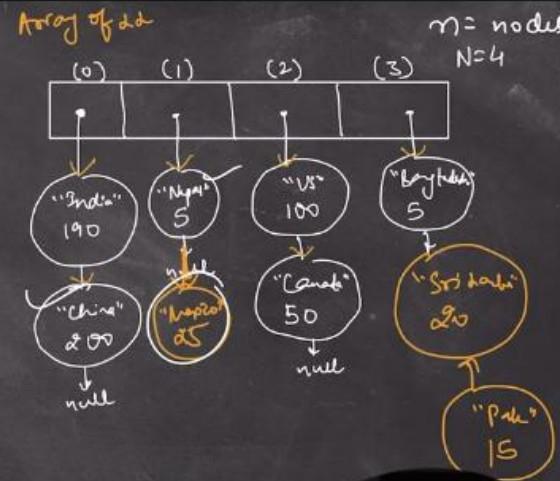
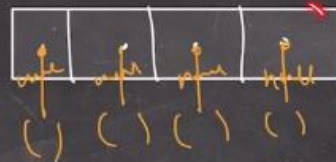
Apna College - 36 / 39

Go to Settings to activate Windows.

Implementation HashMap

O(1)

put()
get()
containsKey()
remove()
size()
keySet()



Video player interface showing the implementation of a HashMap. The video is at 29:44 / 58:18. A small inset shows a person speaking.

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

YouTube

Search

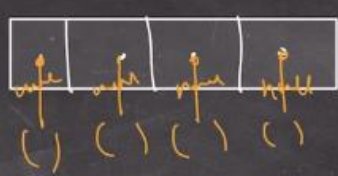
Q

9+

Implementation HashMap

O(1)

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()



Array of 2d

n = nodes
N = 4

(0)	(1)	(2)	(3)
India 190	Japan 5	USA 100	England 5
China 200	India 5	Canada 50	Sri Lanka 20
null	null	null	Pakistan 15

31:38 / 58:18

key → hash function → bit

APNA COLLEGE

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.49M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.

Implementation HashMap

O(1)

- put()
- get()
- containsKey()
- remove()
- size()
- keySet()

```
graph TD
    subgraph Array [Array of 2d]
        direction LR
        A["(0)"] --- B["(1)"] --- C["(2)"] --- D["(3)"]
    end
    A --> N1["India 190"]
    B --> N2["Japan 5"]
    C --> N3["US 100"]
    D --> N4["England 5"]
    N1 --> N5["China 200"]
    N2 --> N6["Russia 25"]
    N3 --> N7["Canada 50"]
    N4 --> N8["Sri Lanka 20"]
    N5 --> null1["null"]
    N6 --> null2["null"]
    N7 --> null3["null"]
    N8 --> null4["null"]
    N9["Pakistan 15"] --> null5["null"]
```

31:48 / 58:18

key → hash function → bit

HashMap Implementation in Java | HashMap | Java with DSA

Apna College
5.49M subscribers

Subscribe

4.9K

Share

Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



YouTube

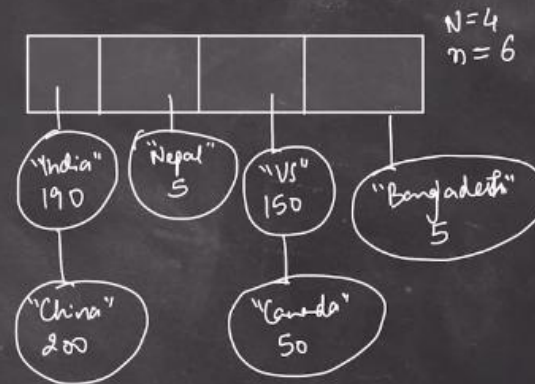
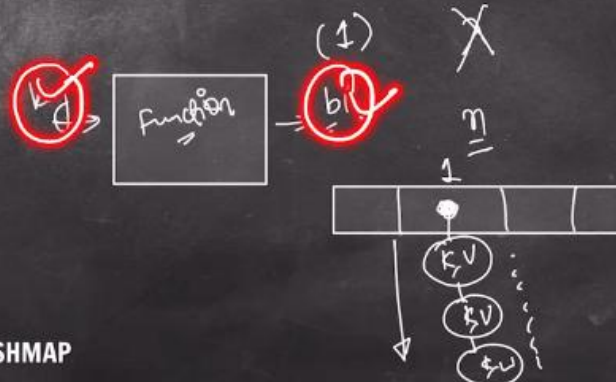
Search



Implementation HashMap

put \rightarrow avg $O(1)$
 $O(n)$

$n=6$



HASHMAP

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.5M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search





YouTube

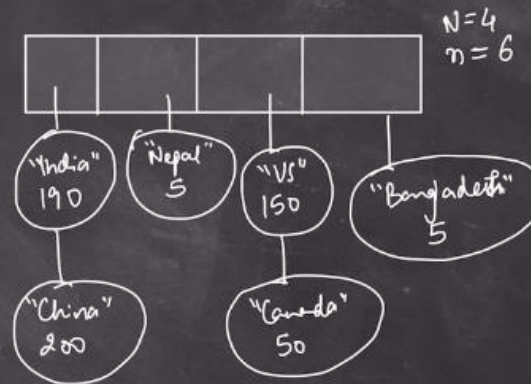
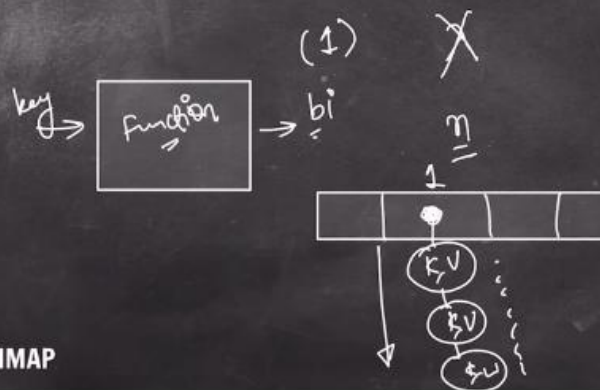
Search



Implementation HashMap

put \rightarrow avg $O(1)$
 $O(n)$

$n=6$



HASHMAP

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.5M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



25°C

ENG

8:16 AM
7/3/2024



YouTube

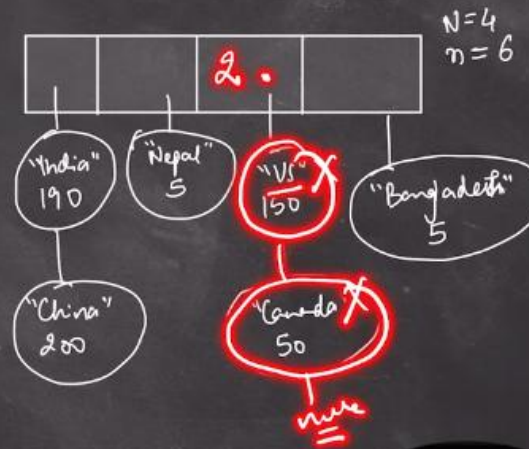
Search



Implementation HashMap

① get(key)
↓
key
exist
(value)
exist X
null

key → bi
searched



Italy
key

Function

2
bi

46:47 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.5M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



8:17 AM
7/3/2024



YouTube

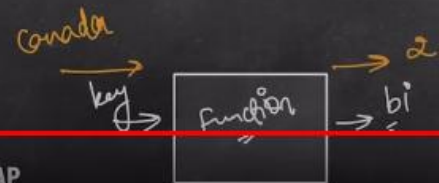
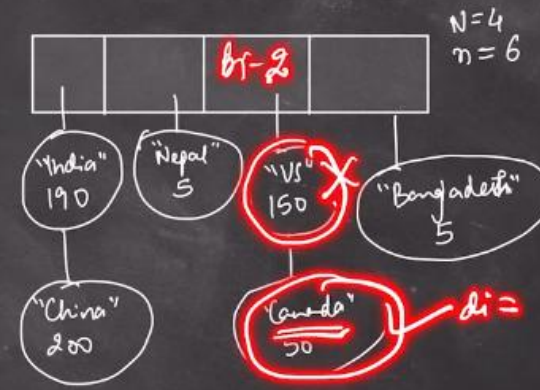
Search



Implementation HashMap

① remove()
↓
exist
do remove
return value
↓
doesn't exist
null

$bi = 2$
 $di =$



49:37 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.5M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.



Type here to search



24°C



8:52 AM
7/3/2024

Implementation HashMap

① remove()

exist
do remove
return value

doesn't exist
null

$bi = 2$
 $di = 1$
 $-1 \rightarrow \text{null}$
if, remove(di)

$N=4$
 $n=6$

India 190
Nepal 5
US 150
Bangladesh 5
China 200
~~Canada 50~~

Canada
key
Function
bi

50:00 / 58:18

HashMap Implementation in Java | HashMap | Java with DSA



Apna College
5.5M subscribers

Subscribe

4.9K



Share



Java & DSA Course for Placement

Apna College - 36 / 39

Go to Settings to activate Windows.