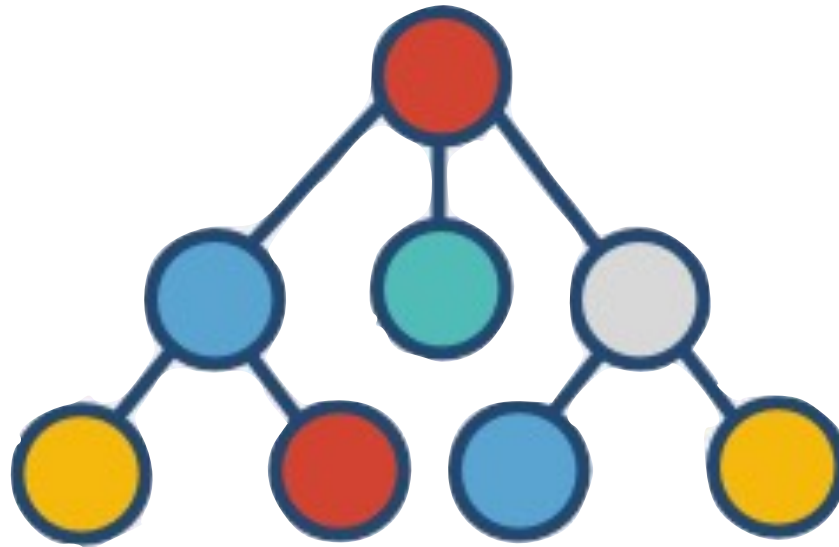


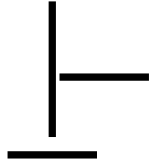
# DATA STRUCTURE & ALGORITHMS



**(By Prince Agarwal)**  
**[ “HELLO WORLD” ]**

## HASHING

### HASHING



Hashing is a technique that is used to uniquely identify a specific object from a group of similar objects.

For Example,

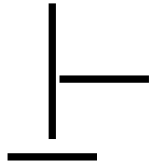


In universities, each student is assigned a **unique** **roll number** that can be used to retrieve information about them.

Hello world

## HASHING

### ■ HASHING



■ Hashing is a technique that is used to uniquely identify a specific object from a group of similar objects.

For Example,

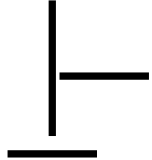


In libraries, each book is assigned a **unique number** that can be used to determine information about the book, such as its **exact position in the library** or the users it has been issued to etc

Hello world

## HASHING

### ■ HASHING



■ Hashing is a technique that is used to uniquely identify a specific object from a group of similar objects.

For Example,

**In both these examples the  
students and books were hashed to a unique number.**

Hello world

## HASHING

- Assume that **you have an object** and you want to assign a **key** to it to **make searching easy**.  
To store the key/value pair
- you can use a **simple array like a data structure** where **keys** (integers) can be used directly as an index to store values

1	2	3	4
PRINCE	SUMIT	PRADEEP	ANANT

PRINCE  
SUMIT  
PRADEEP  
ANANT

**FOR EXAMPLE :-**

**BOOK ID :**      BOOKEW12    REF7201Q    UIQ793QAZ    WEQ13B

where the keys are large and cannot be used directly as an index, you should use *hashing*.

Hello world

## HASHING

■ In hashing,  
large keys are converted into small keys by using **hash functions**.

The values are then stored in a data structure called hash table

The idea of hashing is to distribute entries (key/value pairs) uniformly across an array

Each element is assigned a key (**converted key**)

By using that **key** you can access the element in  **$O(1)$**  time

Using the **key**, the algorithm (hash function) computes an index that suggests where an entry can be found or inserted.

Hello world

## HASHING

Let's Suppose

“abcdef”, “bcdefa”, “cdefab”, “defabc”

KEY	abcdef	bcdefa	cdefab	defabc
VALUE	BOOK OF SCIENCE	BOOK OF ROOW NUMBER	DUMMY INFoRMATI OF BOOKS AND RIJ	BOOK OF SHUYS IBAJD JYEE

### Hash Table

11	defabc
12	
13	
14	cdefab
-	

Hello world

Hash Table		
Index		
0		
1		
-		
-		
-		
11	defabc	
12		
13		
14	cdefab	
-		
-		
-		
-		
23	bcdefa	
-		
-		
-		
38	abcdef	

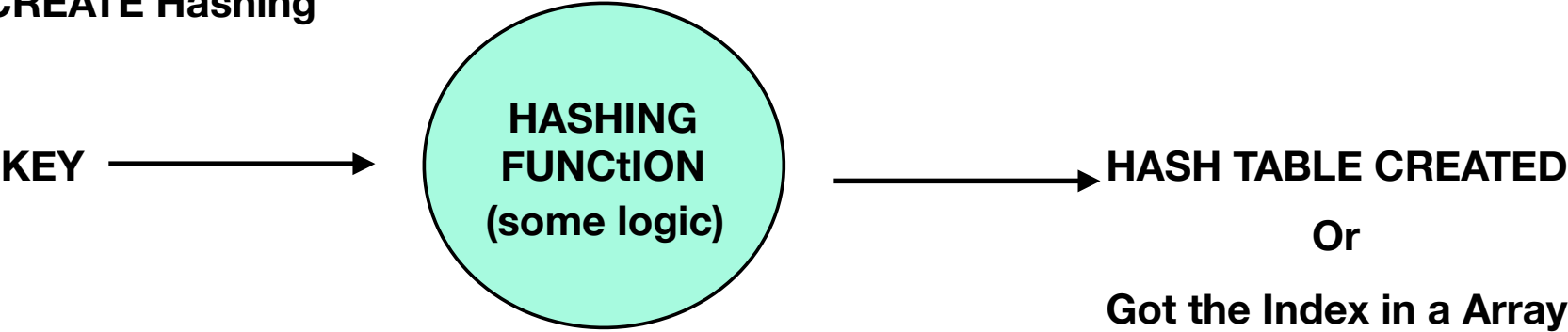
abcdef	bcdefa	cdefab	defabc
BOOK OF SCIENCE	BOOK OF ROOW NUMBER	DUMMY INFoRMATI OF BOOKS AND RIJ	BOOK OF SHUYS IBAJD JYEE
11	14	23	38
BOOK OF SHUYS IBAJD JYEE	DUMMY INFoRMATI OF BOOKS AND RIJ	BOOK OF ROOW NUMBER	BOOK OF SCIENCE

Hello world

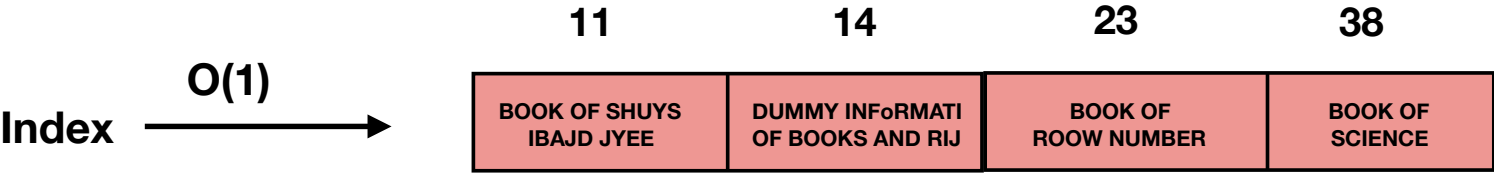
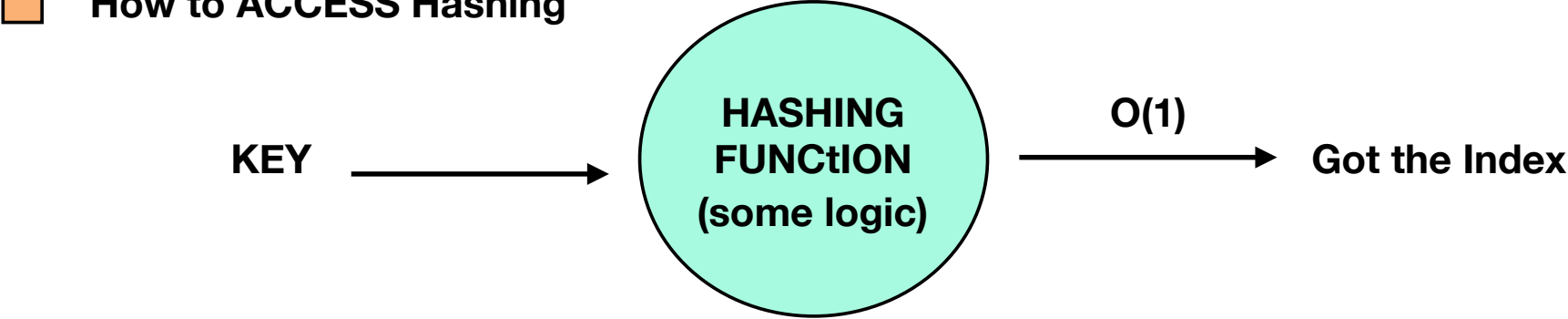


# HASHING

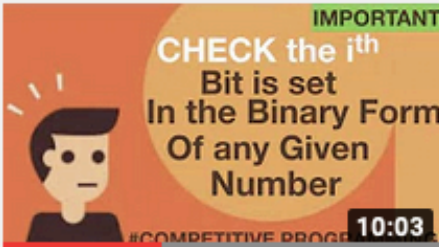




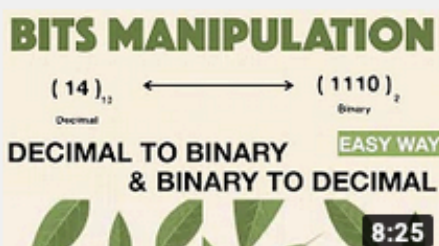
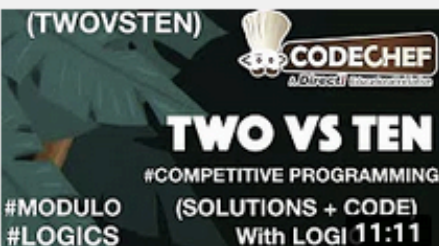








## How to CREATE Hashing



## How to ACCESS Hashing



Hello world

 <p><b>CHECK the <math>i^{\text{th}}</math> Bit is set In the Binary Form Of any Given Number</b></p> <p>IMPORTANT</p> <p>#COMPETITIVE PROGRAMMING 10:03</p>	 <p><b>COUNT THE NUMBER OF ONE'S PRESENT IN BINARY NUMBER</b></p> <p>VERY EASY</p> <p>#COMPETITIVE PROGRAMMING 13:44</p>	 <p><b>CHECK GIVEN NUMBER IS POWER OF 2 ?</b></p> <p>EASY WAY</p> <p>(FULL EXPLANATION WITH CODE)</p> <p>#BITWISE #BINARY</p> <p>HW Hello World</p> <p>#COMPETITIVE PROGRAMMING 15:28</p>	 <p><b>LEFT SHIFT RIGHT SHIFT BITWISE OPERATOR</b></p> <p>EASY WAY</p> <p>(PART - 02)</p> <p>#COMPETITIVE PROGRAMMING 15:24</p>	 <p><b>AND NOT XOR OR BITWISE OPERATOR</b></p> <p>EASY WAY</p> <p>(PART - 01)</p> <p>#COMPETITIVE PROGRAMMING 13:06</p>
<p>Check the <math>i^{\text{th}}</math> bit is set, in the binary form of given number...</p> <p>1.1K views • 1 year ago</p>	<p>Count the number of one's in binary representation of...</p> <p>1.6K views • 1 year ago</p>	<p>Check a given number is power of 2   Bitwise operators...</p> <p>3.2K views • 1 year ago</p>	<p>Left shift and right shift bitwise operator   ...</p> <p>1.4K views • 1 year ago</p>	<p>Bitwise Operators   AND   NOT   OR   XOR    Competitive programming...</p> <p>1.8K views • 1 year ago</p>
 <p><b>BITS MANIPULATION</b></p> <p>(14)<sub>10</sub> ↔ (1110)<sub>2</sub></p> <p>Decimal Binary</p> <p>DECIMAL TO BINARY &amp; BINARY TO DECIMAL</p> <p>EASY WAY</p> <p>#8:25</p>	 <p>(TWOVSTEN)</p> <p><b>TWO VS TEN</b></p> <p>#COMPETITIVE PROGRAMMING</p> <p>#MODULO #LOGICS</p> <p>(SOLUTIONS + CODE) With LOGI 11:11</p>	 <p>(CHEFROUT)</p> <p><b>CHEF AND HIS DAILY ROUTINE</b></p> <p>#COMPETITIVE PROGRAMMING</p> <p>(SOLUTIONS + CODE) With LOGI 12:56</p>	 <p><b>EUCLIDEAN ALGORITHM</b></p> <p>FINDING GCD OF TWO NUMBERS</p> <p>#COMPETITIVE PROGRAMMING</p> <p>12:31</p>	 <p><b>SIEVE OF ERATOSTHENES</b></p> <p>PART - 02 (CODE)</p> <p>#COMPETITIVE PROGRAMMING 12:01</p>
<p>Bits Manipulation   Decimal to Binary   Binary to Decimal...</p> <p>1.5K views • 1 year ago</p>	<p>Program of Two vs Ten Codechef - TWOVSTEN   ...</p> <p>1.3K views • 1 year ago</p>	<p>Program of chef and his daily routine - CHEFROUT   ...</p> <p>1.7K views • 1 year ago</p>	<p>Euclidean algorithm for finding GCD of 2 numbers   ...</p> <p>2K views • 1 year ago</p>	<p>Sieve of Eratosthenes -part 2    Competitive programming...</p> <p>2.2K views • 1 year ago</p>
 <p><b>SIEVE OF ERATOSTHENES</b></p> <p>PART - 01 (LOGIC)</p> <p>#COMPETITIVE PROGRAMMING 8:38</p>	 <p>#Concept / Program of #Prime Numbers</p> <p><b>CONCEPT OF PRIME NUMBERS</b></p> <p>#COMPETITIVE PROGRAMMING 13:38</p>	 <p>VERY IMPORTANT CONCEPTS</p> <p>#memset() function #In C/C++</p> <p><b>USE OF MEMSET()</b></p> <p>#COMPETITIVE PROGRAMMING 12:00</p>	 <p>(FANCY)</p> <p><b>FANCY QUOTES</b></p> <p>#COMPETITIVE PROGRAMMING (SOLUTIONS + CODE) With LOGI 15:46</p> <p>#Strings #getline()</p>	 <p>(ALPHABET)</p> <p>#Clears String Concept #String</p> <p><b>STUDYING ALPHABET</b></p> <p>#COMPETITIVE PROGRAMMING (SOLUTIONS + CODE) With LOGIC 24:28</p>
<p>Sieve of Eratosthenes -part 1    Competitive programming...</p> <p>3.4K views • 1 year ago</p>	<p>Program and concept of prime numbers.   ...</p> <p>2.1K views • 1 year ago</p>	<p>memset() function in C/C++ and its syntax.    Competitive programming...</p> <p>4.3K views • 1 year ago</p>	<p>problem of Fancy Quotes    getline() in strings --FANCY...</p> <p>2.1K views • 1 year ago</p>	<p>Concept of Handling the String related problems -...</p> <p>3.4K views • 1 year ago</p>

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