Q: Given N input strings & Q queries. for each query check if given query is prefix of any given input string.

String starts at index=0 (Complete string is also a prefix)

Note :- 1 =< length of every string <= l

Input strings (N)	Queries (Q)	Ans
anaconda	anaco	✓
dress	fry	×
eaten	roade	✓
friends	algor	✓
roades	sour	×
anaco	dress	✓
algorithms		
sound		

Idea:

1. Insert all the N given words in Trie.
2. for every query string, iterate over the trie from root & check if the query string is prefix or not.

TC: $N \times l \times O(1) + Q \times l \times O(1)$

SC: $N \times l$

Note: Using Trie DS, searching prefix is optimal.

Trie ≡ Prefix Tree

Q: Given a binary matrix mat[N][M], find the no. of distinct rows.

[2 4 3 2 4 5]

mat[7][5]   N×M

	0	1	2	3	4	
0	1	0	0	1	0	×
1	1	1	0	1	1	×
2	0	1	0	1	0	✓
3	1	1	0	1	1	✓
4	1	1	0	0	1	✓
5	1	0	0	1	0	✓
6	0	0	1	1	0	✓

⇒ 5

Idea 1:

For every row, compare it with all the rows below it. if freq == 0 ⇒ count++

TC: (# of row comparisons) * (TC for each row comparison)

$$N^2 \times M$$

$$\Rightarrow O(N^2 M)$$

SC: $O(1)$

Idea 2 :

Convert each row into String & insert into HashSet.

$$TC: \underbrace{N*M}_{\text{Converting each row into String}} + \underbrace{N\times M}_{\text{To insert N String in HS.}}$$

$: O(NM)$

SC: $O(NM)$

Idea 3 : Binary to Decimal

mat[7][5]

	2^4	2^3	2^2	2^1	2^0	
	0	1	2	3	4	
0	1	0	0	1	0	⇒ 18
1	1	1	0	1	1	⇒ 27
2	0	1	0	1	0	⇒ 10
3	1	1	0	1	1	⇒ 27
4	1	1	0	0	1	⇒ 25
5	1	0	0	1	0	⇒ 18
6	0	0	1	1	0	⇒ 6

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(I) for every row, convert it into decimal.

(II) Insert all the decimal no's in HashSet.

$$TC: \underbrace{O(N.M)}_{\text{Convert every row into decimal}} + \underbrace{O(N)}_{\text{Insert N integers in HashSet.}}$$

$: O(NM)$

SC: $O(N)$

M bits

$M < 31 \Rightarrow$ int

$M < 64 \Rightarrow$ long

$M = 100 \Rightarrow$ ×

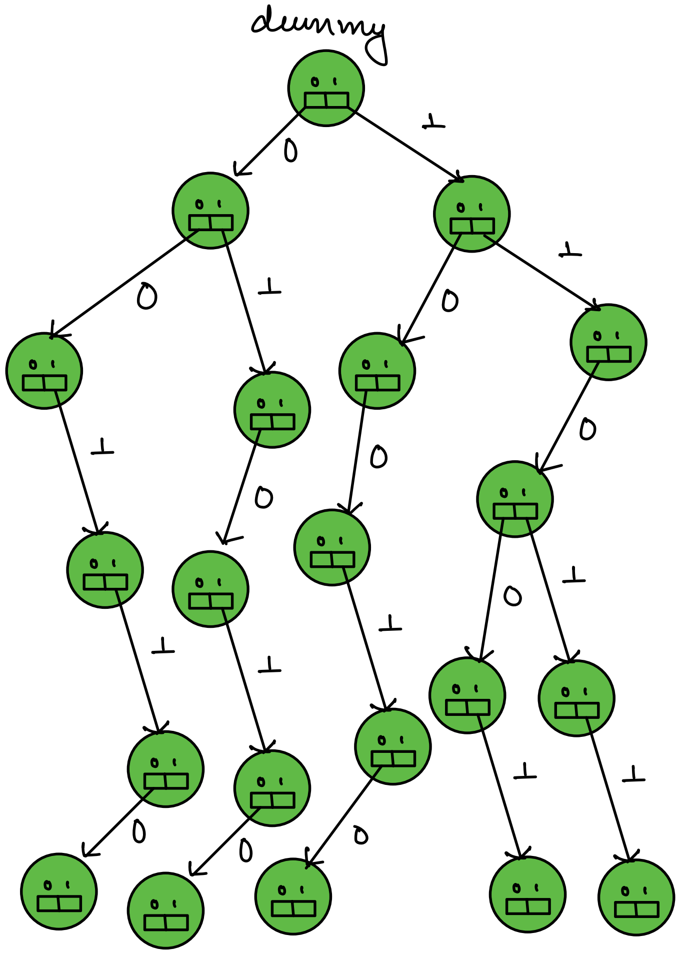
Idea 4: Trie

⇒ Insert each row in Trie

```
Class Node {
    Node left;
    Node right;
}
```

✓

```
Class Node {
    Node c[2];
    Node() {
        c[0] = Null;
        c[1] = Null;
    }
}
```



⇒ When inserting a row in Trie, if we are not creating a single new node, it means entire row is already present in the trie.

```
Node root = new Node().
```

```
int uniqueRows( int mat[][] , N, M){
      count =0
      for(i=0; i< N; i++){
            if (insert (root, mat[i], M)){
                  count ++
            }
      }
      return count;
}
```

will return true if even a single node was created while inserting the row in Trie.

```
bool insert (root, arr[], M){
      bool flag = false;
      for( i=0; i< M ; i++){
            //Insert arr[i]
            e = arr[i];
            if (root.c[e] ==NULL){
                  //Create a new node
                  root.c[e] = new Node();
                  flag = true
                  root = root.c[e];
            }
            else{
                  root = root.c[e];
            }
      }
      return flag;
}
```

TC : O(NM)

SC : O(NM) { less than N×M }

Q. Given an Array of N elements, find the max XOR value of any pair.

A[i] ^ A[j] ⇒ Max

i != j

A :	0	1	2	3
	4	3	2	7

A[0] ^ A[1] = 4 ^ 3 = 7 ✓

A[0] ^ A[2] = 4 ^ 2 = 6

A[0] ^ A[3] = 4 ^ 7 = 3

A[1] ^ A[2] = 3 ^ 2 = 1

A[1] ^ A[3] = 3 ^ 7 = 4

A[2] ^ A[3] = 2 ^ 7 = 5