

Lecture - 8

Array's → vector Array

vector: vector is a data structure which is used in array. vector is an array which size not defined. It is a dynamic array.

Syntax:-

vector<int> arr; //declaration
 ↑ ↑
 Syntactical datatype variable name

It's default size is 0

When it's default size is completely full then it is automatically double it's size.

Ex:- 5, 7, 8, 9

5 | 7 | 8 | 9 | | |

{ } { }

// Initialization of vector:-

vector<int> arr(10, 20, 30);

vector<int> arr(10, -1);

Q:- How to create vector by input by self?

Ans:-

int n;

cin >> n;

vector<int> arr(n);

- To website for learning -
- ① appreference.com
- ② c++ .com

To insert element in vector
arr.push_back();

To remove element from vector
~~arr.pop_back()~~ arr.pop_back();

To find size of vector array
arr.size();

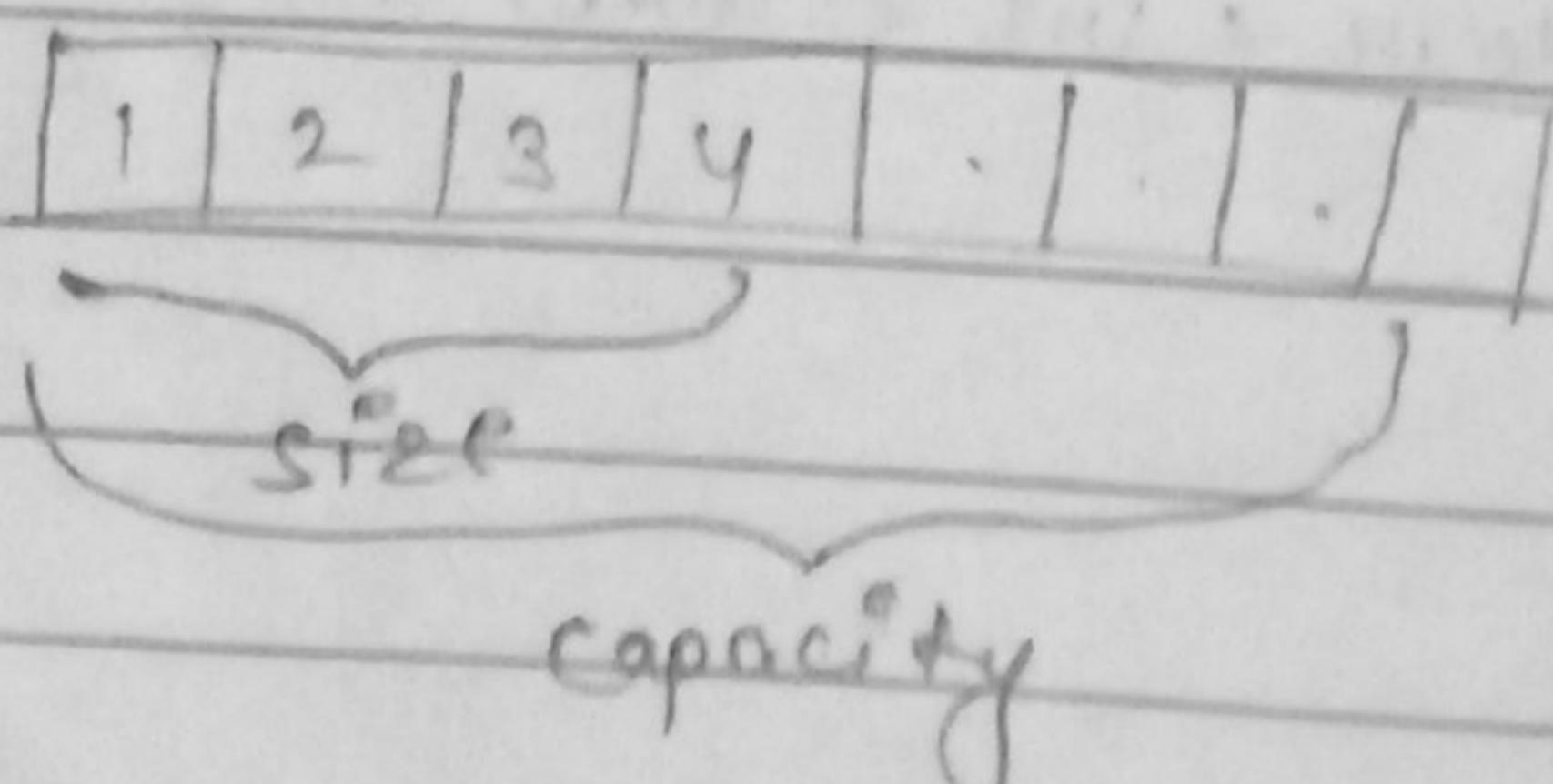
To find array is empty or not.
arr.empty();
It return 0/1 (true/false).

Creating Vector Array.

#include <vector>

```
int main{  
    char arr[5] vector<int> arr;  
    cout << arr.size() << endl;  
    cout << arr.capacity() << endl;  
    cout << arr {  
        int ans = (size of (arr) / sizeof(int));  
        cout << ans << endl;  
    }  
    cout << arr[0] << endl;  
}
```

Capacity () :- Return the no. of element
that can be currently allocated storage



size :- Element stored.

capacity :- How many element can be stored.

Q. How to print all insert in vector?

Ans:- Output → for (int i=0; i < arr.size(); i++) {

(2) → cout << arr[i] << " ";

}

→ cout << endl;

① II insert

→ arr.push_back(5);

→ arr.push_back(6);

② Remove :-

→ arr.pop_back();

It only remove the last element from the array (like as a stack).

→ for (int i=0; i < arr.size(); i++) {

→ cout << arr[i] << " ";

}

cout << endl;

Ex:- vector<int> b(10);

cout << "Size of b" << b.size() << endl;

cout << "Capacity of b" << b.capacity()
<< endl;

for (int i=0; i < b.size(); i++) {

cout << b[i] << " ";

}

cout << endl;

Ex-1

```
vector<int> b(10, -1);
for (int i=0; i<b.size(); i++) {
    cout << b[i] << " ";
}
cout << endl;
```

return 0; }

Ex-2

```
int n;
cout << "Enter the size" << endl;
cin >> n;
vector<int> v(n, -101);
for (int i=0; i<v.size(); i++) {
    cout << v[i] << " ";
}
cout << endl;
```

Ex-3

```
vector<int> d{10, 20, 30, 40};
for (int i=0; i<d.size(); i++) {
    cout << d[i] << " ";
}
cout << endl;
```

cout << "Vector d is empty or not."
<< d.empty() << endl;

Initialization of vector:-

- `vector<int> a[10];` → It initialize all value to 0.

- `vector<int> a[n];` → It initialize all value to 2.

- vector <int> arr {10, 20, 30, 40}; \rightarrow Not good practice
- vector <int> arr(n); \rightarrow usual input

Q:- Find unique Element in an Array?

Ans:- I/P \rightarrow arr $\rightarrow \{1, 2, 4, 2, 1, 3, 6, 5, 5, 6, 4\}$

Every element occurs twice except one element

O/P \rightarrow 3

Same Element cancel out by XOR

$1 \wedge 1 \rightarrow 0$

$2 \wedge 2 \rightarrow 0$

$2 \wedge 2 \wedge 3 \rightarrow 3$

a	b	a \wedge b
XOR \rightarrow	0	0
0	0	0
1	0	1
0	1	1
1	1	0

II Unique Element:-

int n;

cout << "Enter the size of array" << endl;

cin >> n;

vector <int> arr(n);

cout << "Enter the elements" << endl;

for (int i=0; i<arr.size(); i++) {

cin >> arr[i];

}

int uniqueElement = find unique(arr);

cout << "unique Element is " << unique
Element << endl;

\rightarrow int findunique (vector <int> arr) {

int ans = 0;

for (int i=0; i<arr.size(); i++) {

ans = ans ^ arr[i];

3

QUESTION ANSWER:

?

Q-8. Find union of two arrays?

(a) $a[] \rightarrow \{2, 4, 6, 8\} \rightarrow - I/P$

(b) $b[] \rightarrow \{1, 3, 7\}$

O/P $\rightarrow ans[] = \{1, 2, 3, 4, 6, 7, 8\}$

int sizea=5; \leftarrow int arra[] = {1, 3, 5, 7, 9};

int sizeb=4; \leftarrow int arrb[] = {2, 4, 6, 8};

int sizeb=4;

vector<int> ans;

// push all element of vector arra

for (int i=0; i<sizea; i++) {

ans.push_back(arra[i]); } i;

?

for (int i=0; i<sizeb; i++) {

ans.push_back(arrb[i]); }

?

// print ans

cout << "Printing array" << endl;

for (int i=0; i<ans.size(); i++) {

cout << ans[i] << " ";

?

- ① Searched element \rightarrow Try yourself
 ② Duplicated element's \rightarrow " "

Q-3- Intersection of two arrays?

$$a[] = \{1, 2, 3, 4, 6, 8\}$$

$$b[] = \{3, 4, 9, 10\}$$

ans $\rightarrow \{3, 4\}$ (common element)

Algo:- using linear search

vector<int> arr1{1, 2, 3, 4, 6, 8};

vector<int> arr2{3, 4, 9, 10};

vector<int> ans;

for every loop on arr1 vector.

```
for (int i=0; i<arr1.size(); i++) {
```

int element = arr1[i];

for every element, run loop on arr2

```
for (int j=0; j<arr2.size(); j++) {
```

if (element == arr2[j]) {

arr2[j] = -1; \leftarrow
ans.push_back(element);

It is used to

3 3 3

mark element
that element
we checked.

if print ans \rightarrow why this

```
for (auto value : ans) {
```

cout << value << " ";

3

cout << endl;

① if $a[] = \{1, 2, 3, 3, 4\}$

$b[] = \{3, 3, 4\}$

② If we use -ve value in array a & b then
to mark we use INT-MIN

to determine the next step condition

Using Intersection logic mark common element

Ques Union is anyway if no. int. dupl. any.

Ans We can mark duplicates to INT-MIN

then if (value == INT-MIN){

ans.push-back (value);

}

Ques ans will it include vector?

#include <climits>

int main(){

int arr[] = {1, 2, 4, 6, 8, 10};

int sizea = 6;

int brr[] = {3, 4, 5, 6};

int sizeb = 4;

vector<int> ans;

//intersection logic for duplicates

for (int i=0; i < sizea; i++){

for (int j=0; j < sizeb; j++){

if (arr[i] == brr[j]) {

//mark element as -1

brr[j] = INT-MIN;

333

//finding union

for (int i=0; i < sizea; i++){

ans.push-back (arr[i]);

g

for (int j=0; j < sizeb; j++){

ans.push-back (brr[j]);

if (brr[j] != INT-MIN)

{}

33

cout << "printing array" << endl;

for (auto value : ans){

cout << value << " ";

3

cout << endl;

return 0;

3

Q.5- Pair of sum :-

$\text{arr} \rightarrow \text{arr} = \{1, 3, 5, 7, 2, 4, 6\}$

~~pair of sum~~

sum = 9

alp →

find the pair that upon addition gives value equal to sum?

Ans: $\text{int} \text{ty} = \text{sum}$.

Pairs :- $(1, 3) (3, 5) (5, 7) [(7, 2)] (2, 4) (4, 6)$
 $(1, 5) (3, 7) (5, 2) (7, 4) (2, 6)$
 $(1, 7) (3, 2) [(5, 4)] (7, 6)$
 $(1, 2) (3, 4) (5, 6)$
 $(1, 4) : [(3, 6)]$
 $(1, 6)$

vector <int> arr {1, 3, 5, 7, 2, 4, 6}

// print all pairs int sum = 9;

Outer loop will traverse for each element.

for (int i = 0; i < arr.size(); i++) {

 int element1 = arr[i];

 // for every element, will traverse for next element

 for (int j = i + 1; j < arr.size(); j++) {

 cout << "(" << element1 << "," << arr[j]

 << ")" << endl;

 } // int element2 = arr[j]

 if (element1 + arr[j] == sum) {

 cout << "Pair found" << element1 << "," <<

 arr[j] << endl;

3

2 3

Q If there are we want to three elements we run 3 for loop for element 1, element 2, element 3.

Q-6 Find the pair sum of 4 nos.
 $x+y+z+p = \text{sum}$.

$i=0 \rightarrow \text{array.size()}$

$j = i+1 \rightarrow \dots$

$k = j+1 \rightarrow \dots$

$l = k+1 \rightarrow \dots$

int main()

vector<int> arr{1, 3, 5, 7, 2, 4, 6};

int sum = 18;

for (int i = 0; i < arr.size(); i++) {

int element1 = arr[i];

for (int j = i+1; j < arr.size(); j++) {

int element2 = arr[j];

for (int k = j+1; k < arr.size(); k++) {

int element3 = arr[k];

for (int l = k+1; l < arr.size(); l++) {

int element4 = arr[l];

if (element1 + element2 + element3 + element4
= sum) {

cout << "Pair found" << endl;

}

}

}

return 0;

}

Twisted exercise

o $\{10, 10, 30, 40, 50\}$

sum = 80

pair sum = sum

i → 0 → arr.size() → elem 1

j → 1 → " → elem 2

k → 2 → " → elem 3

int main() {

vector<int> arr {1, 3, 5, 7, 2, 4, 6, 8};

int sum = 0;

for (int i = 0; i < arr.size(); ++i) {

int element 1 = arr[i];

for (int j = i + 1; j < arr.size(); ++j) {

int element 2 = arr[j];

for (int k = j + 1; k < arr.size(); ++k) {

int element 3 = arr[k];

// cont'd "Pair is (" + elements + ", " + element 2

+ " , " + element 3 + ")" + endl;

if (elements + element 2 + element 3 == sum) {

cout << "Pair found (" + element 2 + ", " + "

element 2 + " , " + element 3 + ")" + endl;

else {

// cout << "Pair not found" + endl;

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3

2

Method O:

2

Q. 8.

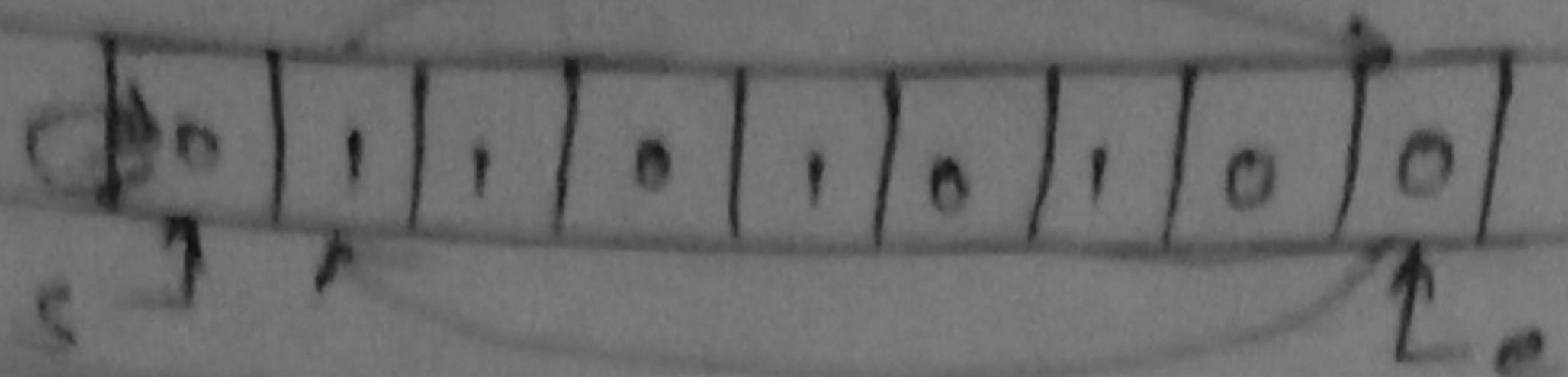
Given arr = [0, 1, 0, 1, 1] Dutch National Flag

Ans:-

arr → [0, 1, 0, 1, 1]

arr → [0, 0, 0, 0, 1, 1, 1]

2 pointer approach for question
Extreme point.



vector<int> arr{0, 1, 0, 1, 1, 0, 1, 0, 1, 1};

int start = 0;

int end = arr.size() - 1;

int i = 0;

while (i != end) / (start <= end)

if (arr[i] == 0) {

// swap from left

swap(arr[start], arr[i]);

i++;

start++;

}
if (arr[i] == 1) {

// swap from right

swap(arr[^{end}_i], arr[i]);

end--;

Barcode

?

?

for (auto value : arr) {
cout << value << " ";

g

→ ↗ HOME WORK → ↘

Q-① Left rotate an array by one element?

② Majority element in an array. (Leetcode 169)

③ Buy & sell stock → level 1 (Leetcode Q-121)

④ Point counting ~~some~~ by vertical array?

⑤ Find factorial of a number by using
vector or function?

⑥ We have an array create an number?

⑦ ~~Ans.~~

Q Swap can be various approaches ans:-

① swap (start, end)

② start = start + end;

end = start - end;

start = start - end;

③ start = start * end;

end = start / end;

start = start / end;

④ temp = start;

start = end;

end = temp;

⑤ start = start ^ end;

end = start ^ end;

start = start ^ end;

⑥ Left by one place shifting in an array - brute force
Ans:- int main() {

// Left rotate an array by one element

vector<int> arr = {1, 2, 3, 4, 5};

for (int i = 1; i < arr.size(); i++) {

swap(arr[i - 1], arr[i]);

g

// pointing

```
for (auto val : arr) {
```

```
    cout << val << " ";
```

```
}
```

```
return 0;
```

```
}
```

Q. Why 1?

→ If we start from 0 then it will take a garbage value.

→ That's why we use 1.

→ If not understand please download the program.

Q. Leetcode - 169

→ Majority Element

```
I | 9 → {3, 2, 3, 4, 3, 2, 1, 3, 3}  
0 | 9 → 3
```

```
#include <vector>
```

```
void findMajority(vector<int> arr, int n)
```

```
{ int maxCount = 0;
```

```
int index = -1;
```

```
for (int i = 0; i < n; i++) {
```

```
    int count = 0;
```

```
    for (int j = 0; j < n; j++) {
```

```
        if (arr[i] == arr[j]) {
```

```
            count += 1;
```

```
}
```

```
if (count > maxCount) {
```

```
    maxCount = count;
```

```
    index = i;
```

(i) (minimum == 0/0)

Result is zero [Index] is odd;

else

result is "No majority element is odd";

Int min(0);

vector<int> arr{1, 2, 3, 4, 5};

Int n = arr.size();

Find Majority (arr, n);

return 0;

}

8.3 - Leetcode Question - 12)

Buy & Sell stocks

check code on Leetcode for
version understanding

Int maxProfit(vector<int> &prices);

Int lsf = INT-MAX;

Int op = 0;

Int pslt = 0;

for (int i = 0; i < prices.size(); i++) {

if (prices[i] < lsf) {

lsf = prices[i];

}

pslt = prices[i] - lsf;

if (op < pslt) {

op = pslt;

3

3

maxim op;

3

```
int main() {  
    vector<int> prices {7, 4, 5, 3, 6, 4};  
    int overall = maxProfit(prices);  
    cout << "Overall Profit : " << overall << endl;  
}
```

Q-4. Pointing the counting of vectors among elements.

```
void using_index(vector<int> &arr) {  
    for (int i = 0; i < arr.size(); i++) {  
        cout << arr[i] << " ";  
    }  
}
```

```
cout << endl;
```

```
int main() {
```

```
    vector<int> arr {10, 20, 30, 40, 50, 60};  
    using_index(arr);  
    return 0;  
}
```

Q-5- factorial of a number using vector our function?

Done in vs code (code)

Q-6- We have an array calculate a number?
Ans:-
1/9 → [1, 2, 3, 4]
0/9 → 1234

~~ans[0] * 10 +~~

ans = ans * 10 + digit

a) Include <iostream> ?

b) Include <vector> ?

using namespace std;

int main() {

vector<int> digit{ 8, 2, 3, 4 };

int ans = 0;

for (int i = 0; i < digit.size(); i++) {

ans = ans * 10 + digit[i];

}

digit.

(can't be "vector Array to Number" or one second)

g

p.s