

Lecture - 12

:- Binary Search :-

→ Binary Search only apply monotonic function.

0	1	2	3	4
3	5	9	13	27

Condition
↓
Element should
be in monotonic
function

- to find mid
- if $key == mid$ element found
- if $key > mid$
mid start = mid + 1
find mid.

- if $key < mid$
end = mid - 1
find mid.

=

			mid			
3	7	11	13	19	27	
0	1	2	3	4	5	

key = 27

$$mid = \frac{start + end}{2} = \frac{0 + 5}{2} = 2$$

$$11 \neq 27$$

$$27 > 11$$

13	19	27
3	4	5

$$mid = \frac{3 + 5}{2} = 4$$

$$19 \neq 27$$

$$27 > 19$$

27

27 == key element found

En	4	8	16	22	34
	0	1	2	3	4

key = 4

• $mid = \frac{s + e}{2} \Rightarrow \frac{0 + 4}{2} = 2$

• $16 \neq 4$

•

4	8
0	1

• $mid = \frac{0 + 1}{2} = 0$

• $4 == key$

→ true

return 0;

ans = 0

Use

$mid = s + \frac{e - s}{2}$

Use in large value.

= Binary Search

#include <iostream>

using namespace std;

int binaryIndex(int arr[], int size, int key) {

int start = 0;

int end = size - 1;

int mid = (start + end) / 2;

while (start <= end) {

if (arr[mid] == key)

{

return mid;

}

if (key < arr[mid])


```

    }
    start = mid + 1;
}
if (key < arr[mid]) {
    end = mid - 1;
}
mid = (start + end) / 2;
}
return -1;
}

```

```

int main() {

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    int arr[100];

```

```

    int size;

```

```

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

```

```

    cin >> size;

```

```

    cout << "Enter the element of array: ";

```

```

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

```

```

        cin >> arr[i];

```

```

    }

```

```

    int index = binaryIndex(arr, size, 15);

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```

    cout << "index of 15 is : " << index << endl;

```

```

    return 0;

```

```

}

```