

- Binary Search :-
- Algorithm :-

-4	-1	2	3	5	7	8	9
0	1	2	3	4	5	6	7
↑			↑				↑
start			mid				end

```

while (start <= mid) {
    mid = (start + end) / 2;
    if (array[mid] == element) return mid;
    else if (array[mid] > element) {
        end = mid - 1;
    }
    else if (array[mid] < element) {
        start = mid + 1;
    }
}

```

- Search an element in an infinite array :-

a[] =	1	3	7	8	12	58	72	...	98	...
	0	1	2	3	4	5	6	7	8	9
	↑	↑								
	start	end								

```

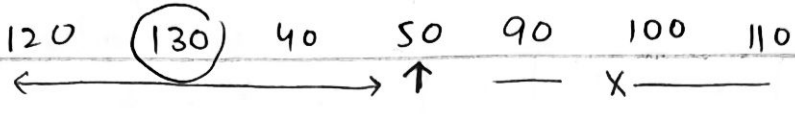
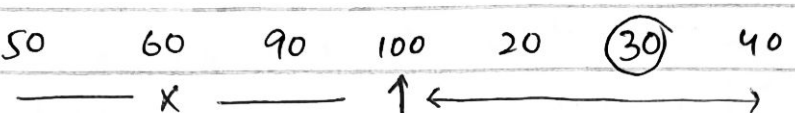
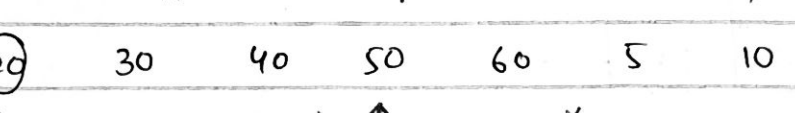
while (a[end] < element) {
    start = end; → 1 → 2 → 4
    end = end * 2; → 2 → 4 → 8
}

```

return binary-search(array, start, end, element);

- In this case we are finding range so that we can solve it in $O(\log N)$.

• Search an Element in a sorted Rotate Array:-

- 120 (130) 40 50 90 100 110

- 50 60 90 100 20 (30) 40

- (20) 30 40 50 60 5 10


← Taking this part ↑ Discarding this part.

$a[] = [20 \mid 30 \mid 40 \mid 50 \mid 60 \mid 5 \mid 10]$ \rightarrow key
 0 1 2 3 4 5 6

function modifiedBinarySearch (array, start, end, element)

{

if (start > end) return -1;

let mid = floor((start + end) / 2);

if (a[mid] == element) return mid;

else-if (array[mid] > array[start]) {

if (element <= a[start] && element < a[mid])

return modifiedBinarySearch (array, start, mid-1, el);

else \rightarrow // it will executed when element is not in sorted array.

return modifiedBinarySearch (array, mid+1, end, el);

else-if (array[mid] < array[end]) {

if (element > mid && element <= a[end]) {

return modifiedBinarySearch (array, mid+1, end, el)

else

return modifiedBinarySearch (array, start, mid-1, el);

• Books allocation:-

Minimize the maximum pages read by a student.
 ↓ students.

10	20	5	15	5
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∴ K = 2

↑

→ This will be the answer.

1st →	10	30	35	50
2nd →	45	25	20	5

10	10	20	30
----	----	----	----

K = 2

$$\min = 30 \quad \text{max value} = 30 -$$

$$\text{max} = \text{Sum values} = 70$$

$$\text{mid} = (\min + \text{max}) / 2 = 50$$

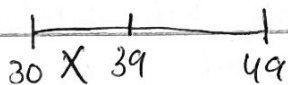
Range



$$\min = 30$$

$$\text{max} = 49$$

$$\text{mid} = 49$$

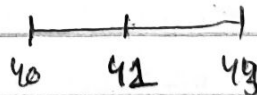
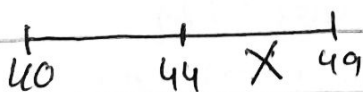


In this case $\left[\begin{array}{c} 10 \\ \leftarrow 1 \rightarrow \end{array} , \begin{array}{c} 10 \\ \leftarrow 2 \rightarrow \end{array} , \begin{array}{c} 20 \\ \leftarrow 3 \rightarrow \end{array} , \begin{array}{c} 30 \\ \leftarrow \end{array} \right]$

∴ K = 3

which is not solution

Range



→ Check code in githubs.