17 2018 October
Wednesday

Searching

Binary search -> Condition
↓
elements should be in monotonic or in sorted order.

---

mid = (start + end) / 2;
↓
In this above line, there is might change to integer overflow.

let say start = $2^{31}-1$ (Index)
end = $2^{31}-1$ (Index)

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When we add (start + end) it exceed the integer limit.

Optimise Way ->

$$mid = start + \frac{(end - start)}{2};$$

STL (Binary search)

binary_search (arr.begin(), arr.end(), target);

STL four

① First Occurance of any target value.

```
auto lowerbound = lower_bound (arr.begin(),
                               arr.end(), target);
int ans = lowerbound - arr.begin();
cout << ans;
```

② Last Occurance of any target value

```
auto upperbound = upper_bound (arr.begin(),
                               arr.end(), target);
```

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```
int ans = upperbound - arr.begin();
cout << ans;
```

Q# In Squar Root How find, flating value.

Precision 2

final ans = 3

step = 0.1

finalans | 3 |

step | 0.1 |

```
for(int i=0; i<precision; i++)
{
    for(double j=finalans; j*j<=n; j=j+step)
    {
        finalans = j
    }
    step = step/10
}
```

finalans | 3 |

① step → j=3 3*3<=10 ✓

finalans = 3 j = 3+0.1

2 step j = 3.1 3.1*3.1<=10 ✓

finalans 3.1 3.1+0.1

③ j = 3.2 3.2*3.2<=10 ✗

step = 0.1/10 = 0.01

3.1	0.01

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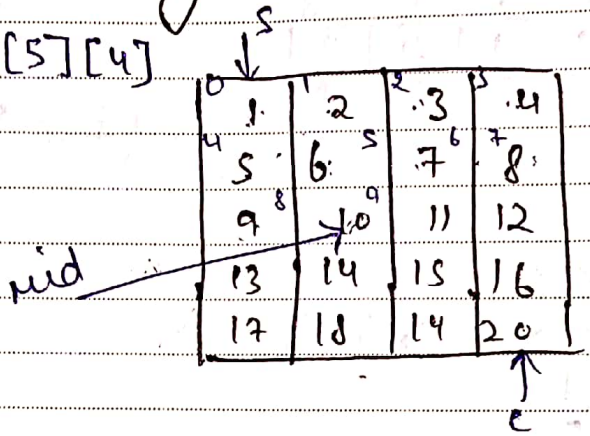
Saturday

Jitna precision Dia hai, utni bar step/10 hota rhega.

Q Binary Search on 2D Array

arr[5][4]



size of()

1) Row = arr.size();
2) Column = arr[0].size();
3) start = 0
4) end = (Row * Col) - 1
   = 20 - 1 = 19
5) mid = (0+19)/2 = 9

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How i find row & column of (10) 'mid value.

Row = mid / column = 9/4 = 2

Column = mid % column = 9 % 4 = 1

November 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

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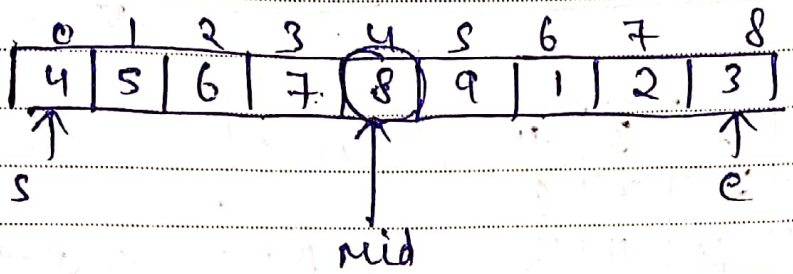
Q- find Pivot element → wo value, jo Monotonic property ko break kr rha hai

Ex-1

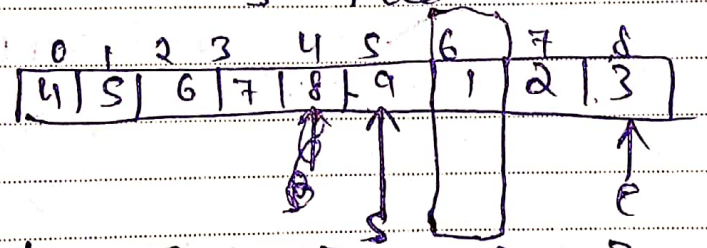


$\frac{0+8}{2} = 4$

7 < 8 ✓ 8 < 9 ✓

∴ arr[s] < arr[mid]

s = mid



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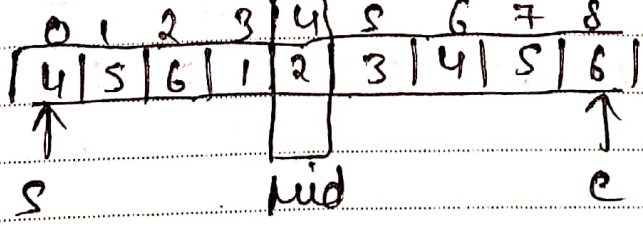
$\frac{5+8}{2} = \frac{13}{2} = 6$

i) arr[mid-1] > arr[mid]
return arr[mid-1]

ii) arr[mid] < arr[mid+1]
return arr[mid]

Ex-2



$\frac{0+8}{2} = 4$

1 < 2 ✓ 2 < 3 ✓

4 > 2 means jo break kr rha hai wo left me hai.

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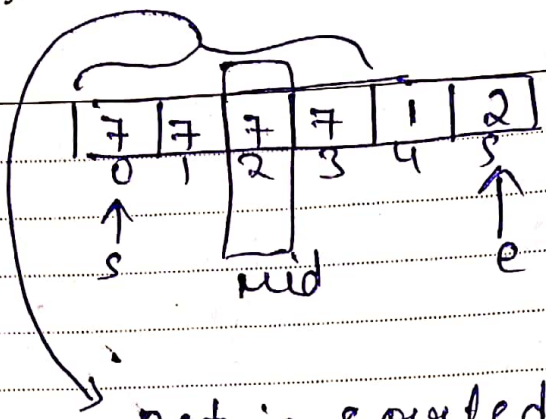
Tuesday

September 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

Ex -3



$\frac{0+5}{2} = 2$

not in sorted order.

Q Divide two number using Binary Search

formula

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quotient * division + remainder = dividend

or

quotient * divisor + = dividend

dividend

$\frac{22}{7}$ or 7)22(

divisor

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Ex 1) $\frac{10}{2}$

0 5 10

s mid e

or quotient

$\frac{0+10}{2} = 5$

$5 * 2 <= 10$ ans = 5

Ex-2 $\frac{22}{7}$ → 22 dividend, 7 → divisor

step1 0 10 11 22

s e mid e

or quotient

$11 * 7 <= 77 > 22$ ✗

step2 0 4 5 10

s e mid e

$\frac{0+10}{2} = 5$

$5 * 7 <= 35 > 22$ ✗

step3 0 2 4

s mid e

$2 * 7 <= 14 < 22$ ✓

ans = 2

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Friday

September 2018

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30						1
2	3	4	5	6	7	8
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16	17	18	19	20	21	22
23	24	25	26	27	28	29

mid

step 4 — 3 (s), 4 (e)

3 * 7 <= 21 < 22 ✓

ans = 3

step 5 — 4 ← mid (s, e)

4 * 7 <= 28 > 22 X

step 6 — s = 4 e = 3 X

s crosses e stop

6 Saturday

Algo →

```
mid = _____
if(mid*divisor == dividend)
    return mid;
if(mid*divisor < dividend)
{   ans = mid;
    s = mid+1;
}
else
```