Class 12

Thursday, November 26, 2020 10:00 PM

arr: 1 1 2 2 2 3 4 5 5 6 7

0 1 2 3 4 5 6 7 8 9 10

lower_bound(arr, 10) →

L = 9

R = 11

arr[10] 10

7 < 10

≥ R=M

< L=M+1

== R=M

```
L=0, R=n
while(L<R)
{
    M = (L+R)/2
    if(arr[M] >= x)  R=M
    else             L=M+1
}
return L;
```

upper_bound(arr, 5)

L=9

R=9

M=

≥ R=M

< L=M

== L=M

```
L=0, R=n
while(L<R)
{
    M = (L+R)/2
    if(arr[M] > x)  R=M;
    else            L=M+1
}
return L;
```

v4 ✓ v5 ✓ v6 × v7 × v8 × v9 × v10 ×

L = v6

R = v7

9h

1h

1h

---

y = sqrt(x)

eps = 1e-6;

while(|L-R| > eps)

X = 6

L = 0

R = X

[0, 6]

[0, 3]

[1.5, 3]

+1

```
while( |L-R| > eps)
{   M = (L+R)/2
    if(M^2 > x) R = M;
    else L = M;
}
```

$R = x$

$[0, 10^{18}] \approx 60$

$[1.5, 3]$

$[2.25, 3]$

$[2.25, 2.625]$

@. 10^{-18} 0.0