Binary Search

↳ Divide & conquer

i = 0
J = 7

1) Sorted array

```
       0  1  2  3   4   5   6   7
arr = [2, 4, 8, 12, 20, 25, 50, 70]
                ↑
             x = 50
```

small Problem → single element

x = 50 ⟷ [50] — only one condition

```
if arr(i) == x :
    return i
return -1
```

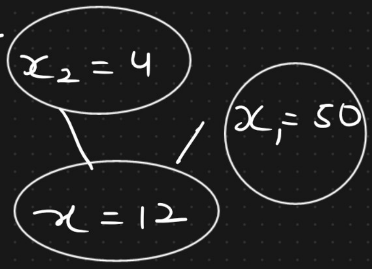
Big Problem →

overflow

mid ⇒ (i+j)//2 = (0+7)//2
= 3

✓

⇒ i + (j-i)//2
(0+7)//2
= 3



```
 0  1  2  3   4   5   6   7
[2, 4, 8, 12, 20, 25, 50, 70] → Sorted
```

BinarySearch(arr, 0, 7, x)

BinarySearch (arr, i, J, x)

i<=J

1. mid = 3

2. arr(mid) == x :
    return mid

Psuedocode

12 < 50
arr(mid) < x

Recursion

BinarySearch(arr, mid+1, J, x)

OR

$i = mid + 1$

$12 > 4$

$arr(mid) > x$ ⌐ Recursion

BinarySearch(arr, i, mid-1, x)

OR

$J = mid - 1$

return -1