

## Selection Procedure

↳ kth smallest element in an array

0 1 2 3 4 5 6 7  
40, 20, 70, 50, 39, 47, 65, 75

$k=2$

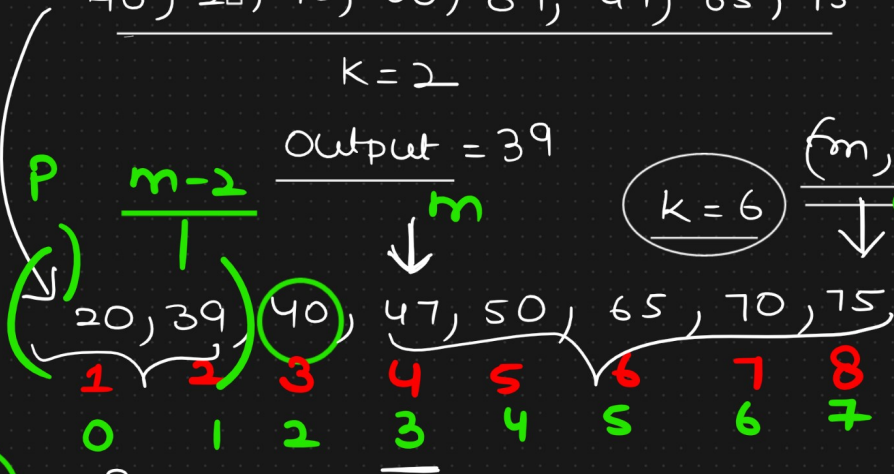
Output = 39

Sorted  
array

$(m, q)$   
 $k=6$   $\downarrow$  9

$m > k$

↳ left



↳ 2

$k$   
3rd smallest element  
in an array

$m = i+1$

↳ 3

↳ Position

Position = index + 1

selectionProcedure(arr, p, q, k):

if  $p < q$ :  $\uparrow \uparrow$  n

m = Partition(arr, p, q)

$\rightarrow$  Position (i+1)

Pseudocode of

selection

procedure

c { if  $m == k$ :  
return arr[m-1]

elif  $m < k$ :

return selectionProcedure(arr, m, q, k)

Right side

$T(q-m)$

else:

return selectionProcedure(arr, p, m-1, k)

Left side

$T(m-p)$

Recurrence Relation

$$T(n) = n + T(m-p)$$

OR

$$n + T(q-m)$$

Best case  
scenario

$$T(n) = n + T\left(\frac{n}{2}\right)$$
$$= \underline{\underline{O(n)}}$$

Worst case  
scenario

$$T(n) = n + T(n-1)$$
$$= \underline{\underline{O(n^2)}}$$

$$a=1 \quad b=2$$

$$\log_2^1 = 0, \quad k=1$$

$$\log_b^a < k$$