

# Quick sort

1	2	3	4	5
3	5	1	2	4

①  $1 < 5$

②  $q \leftarrow \text{partition}(A, 1, 5)$

①  $x = A[5] = 4$

②  $i = 0$

③  $j = 1$

④  $A[1] \leq x$   $3 \leq 4$  ✓

⑤  $i = 1$

⑥ exchange  $A[i] = A[j]$

1	2	3	4	5
3	5	1	2	4

③  $j = 2$

$A[2] \leq 4$   $5 \leq 4$  ✗

④  $j = 3$

$A[3] \leq 4$   $1 \leq 4$  ✓

$i = 2 + 1 = 2$

exchange  $A[2] = A[3]$

1	2	3	4	5
3	1	5	2	4

⑤  $j = 4$

$A[4] \leq 4$   $2 \leq 4$  ✓

$i = 2 + 1 = 3$

exchange  $A[3] = A[4]$

1	2	3	4	5
3	1	2	5	4



⑦ exchange  $A[4] = A[5]$

1	2	3	4	5
3	1	2	4	5

⑧ return  $q = 4$

③ quicksort  $(A, p, q-1)$

①  $1 < 3 \checkmark$

1	2	3
3	1	2

$p=1 \quad r=3$

②  $q = \text{partition}(A, 1, 3)$

①  $x = A[3] = 2$

②  $i = p - 1 = 0$

③  $j = 1$

④  $A[i] \leq x \quad 3 \leq 2 \times$

⑤  $i = 2$

⑥  $A[i] \leq x \quad 1 \leq 2 \checkmark$

⑦ exchange  $A[i] = A[3] = 2$

⑧ exchange  $A[1] = A[2]$

1	2	3
1	3	2

⑨ exchange  $A[2] = A[3]$

1	2	3
1	2	3

⑩ return  $q = 2$

1	2
1	2

$p=1 \quad r=2$

③ quicksort  $(A, 1, 1)$

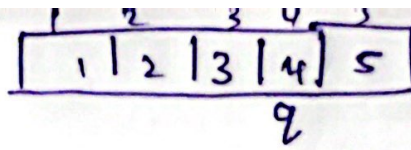
①  $1 < 1 \times$

④ quicksort  $(A, 3, 3)$

②  $3 < 3 \times$



No: \_\_\_\_\_



Date 4, 6, 8

Q quick sort (A, 5, 5)

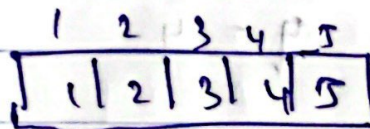
5 < 5 X

$$T_n = a + (n-1)d$$

$$= 4 + (4-1)2$$

$$(2n+2)$$

sorted array



$$T(n) = a + (n-1)d$$

Recurrence Relation

2, 11,

$$T(n) = T(n-1) + 2n$$

$$T(0) = 0$$



$$T(n)$$

$$T(n) = T(n-1) + 2n$$

$$T(n) = T(n-1-1) + 2(n-1) + 2n$$

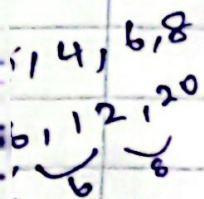
$$= T(n-2) + 4n - 2$$

$$T(n) = T(n-2-1) + 4(n-1) - 2 + 2n$$

$$= T(n-3) + 6n - 6$$

$$= T(n-3-1) + 6(n-1) - 6 + 2n$$

$$= T(n-4) + 8n - 10$$



$$2 \times 6, 2 \times 10$$