

Complexity: $O(N * \text{Log}(N))$ on the average

RANDOMIZED-QUICKSORT (A, p, r)

```
1 if  $p < r$ 
2      $q = \text{RANDOMIZED-PARTITION}(A, p, r)$ 
3     RANDOMIZED-QUICKSORT ( $A, p, q - 1$ )
4     RANDOMIZED-QUICKSORT ( $A, q + 1, r$ )
```

RANDOMIZED-PARTITION (A, p, r)

```
1  $i = \text{Random}(p, r)$ 
2 exchange  $A[r]$  with  $A[i]$ 
3 return PARTITION ( $A, p, r$ )
```

PARTITION (A, p, r)

```
1  $x = A[r]$ 
2  $i = p - 1$ 
3 for  $j = p$  to  $r - 1$ 
4     if  $A[j] \leq x$ 
5          $i = i + 1$ 
6         exchange  $A[i]$  with  $A[j]$ 
7 exchange  $A[i+1]$  with  $A[r]$ 
8 return  $i + 1$ 
```

```
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2      $q = \text{RANDOMIZED-PARTITION}(A, p, r)$ 
3      $\text{RANDOMIZED-QUICKSORT}(A, p, q - 1)$ 
4      $\text{RANDOMIZED-QUICKSORT}(A, q + 1, r)$ 
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$\text{RANDOMIZED-PARTITION}(A, p, r)$

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1  $i = \text{Random}(p, r)$ 
2 exchange  $A[r]$  with  $A[i]$ 
3 return  $\text{PARTITION}(A, p, r)$ 
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