

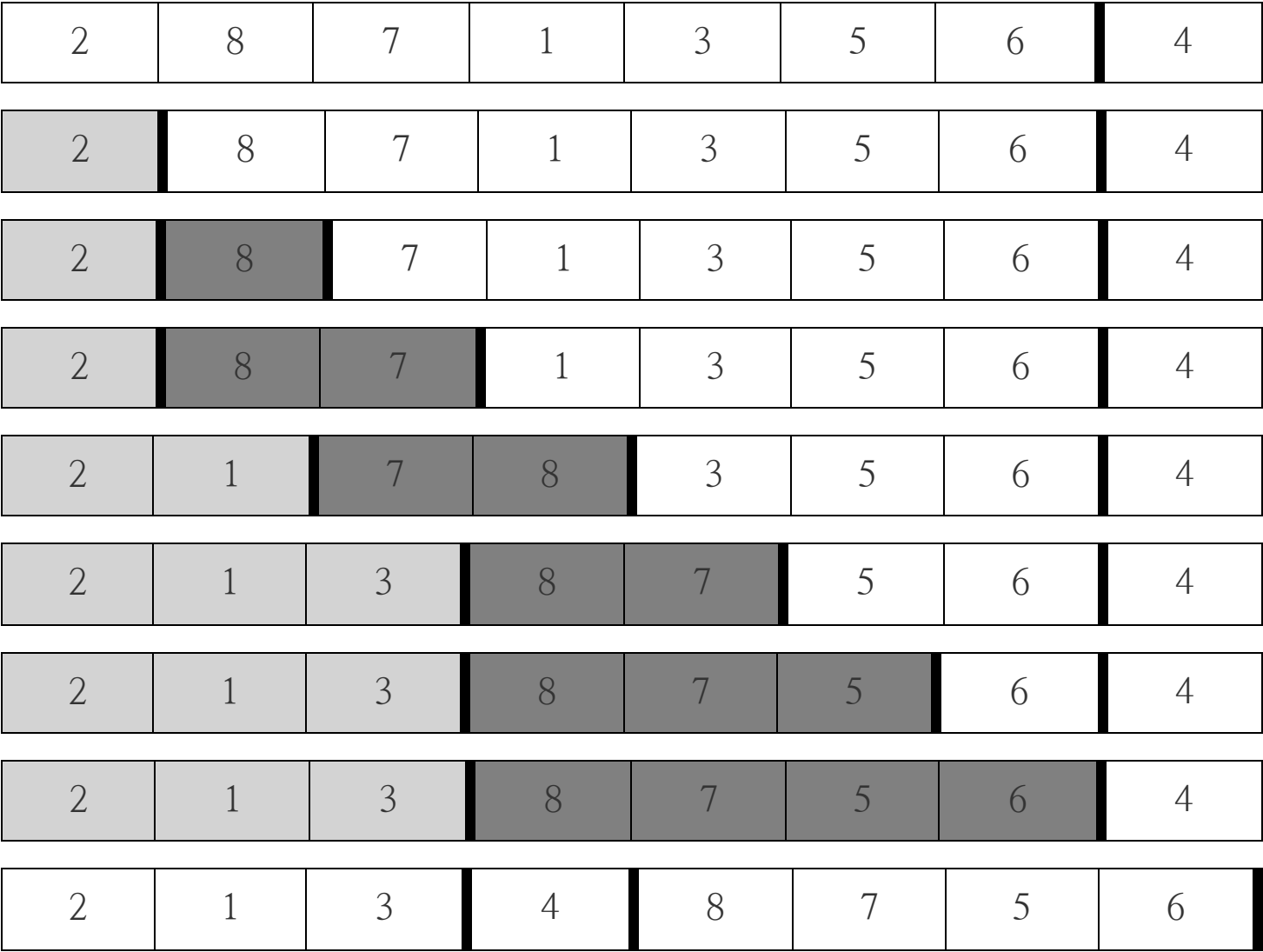
Review 6

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Problem 1

Illustrate the operation of **PARTITION** on the array $A = \{2, 8, 7, 1, 3, 5, 6, 4\}$

Solution 1



Problem 2

Answer questions about the following function **SELECT(A, p, r, i)** where $r - p + 1 = n$

```

SELECT(A, p, r, i)
    if p == r
        return A[p]
    q = PARTITION(A, p, r)
    k = q - p + 1
    if i == k
        return A[q]
    else if i < k
        return SELECT(A, p, q - 1, i)
    else
        return SELECT(A, q + 1, r, i - k)

```

- What does it do?
- What is the worst-case running time?
- What is the best-case running time?

Solution 2-a

`SELECT` selects `i`-th smallest element in the array `A`.

Solution 2-b

The worst-case occurs when the `PARTITION` partitied the array unbalanced.

So, time-complexity of the case is:

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

$$\therefore T(n) = O(n^2)$$

Solution 2-c

The best-case occurs when the `PARTITION` partitied the array balanced, which means pivot is median.

So, time-complexity of the case is:

$$T(n) = T(n/2) + O(n)$$

$$\therefore T(n) = O(n)$$