Data Structures & Algorithms

Quick Sort Algorithm

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Theme 1: The Problem

۷ – بر روی داده های زیر دو مرحله مرتب سازی سریع را اجرا کنید(pivot اولین عنصر). مرتب سازی به صورت نزولی انجام شود.(۱.۵ نمره)

33, 40, 2 , 19, 71, 55, 29, 60, 22, 26

Theme 2: Solution

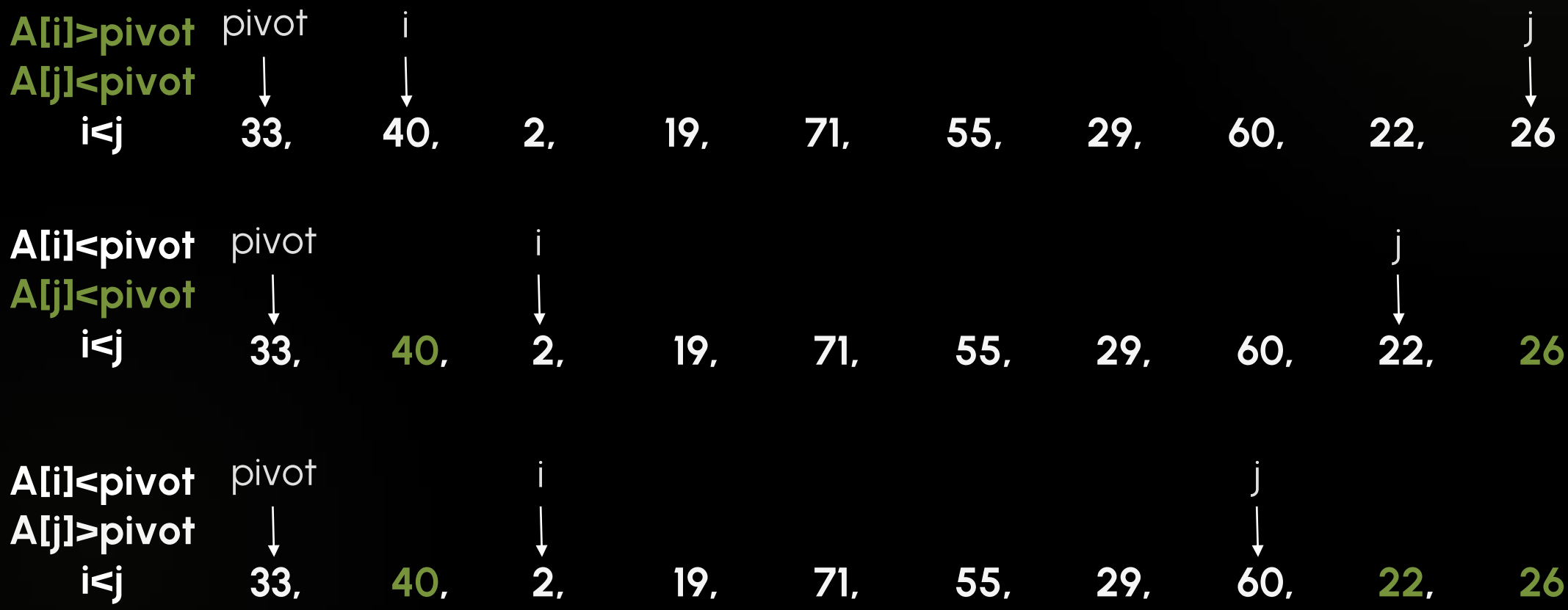
Reasoning

The goal of the partitioning stage is to place the pivot in its final sorted position such that:

- All elements to its left are $\geq pivot$ (since we are sorting in descending order, these are the smaller elements).
- All elements to its right are $\leq pivot$ (these are the larger elements).

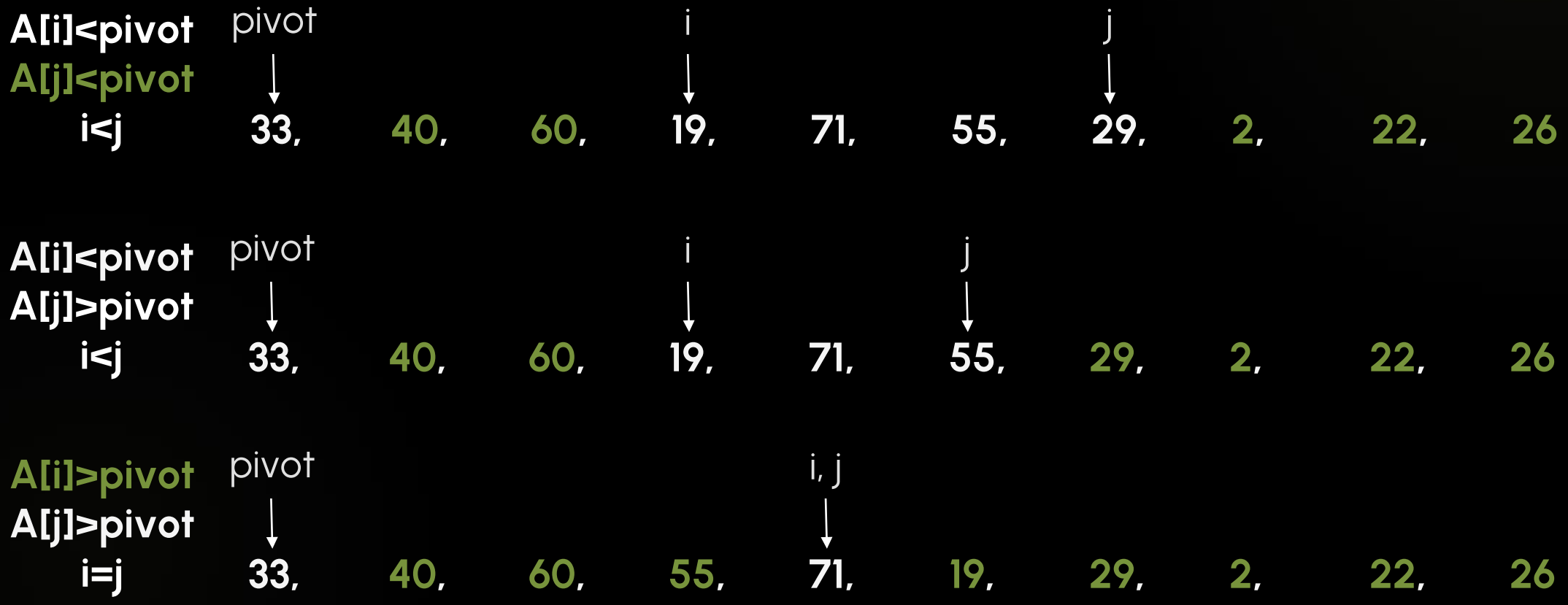
First Pass:

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.



First Pass (Cont.):

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.



First Pass (Cont.):

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.

A[i]<pivot
A[j]>pivot
i>j

pivot ↓ j ↓ i ↓

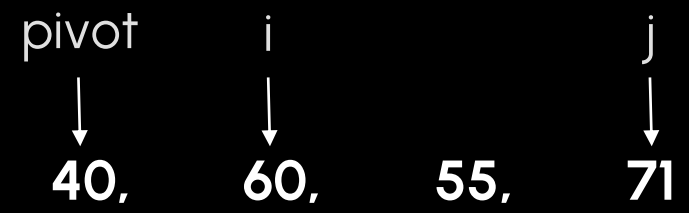
33, 40, 60, 55, 71, 19, 29, 2, 22, 26

40, 60, 55, 71, 33, 19, 29, 2, 22, 26

Second Pass – Fist Part:

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.

A[i]>pivot
A[j]>pivot
i<j



A[i]<pivot
A[j]<pivot
i<j

A[i]<pivot
A[j]<pivot
i=j

Second Pass – Fist Part:

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.

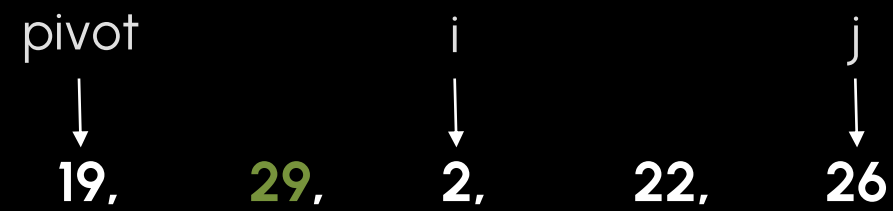
60, 55, 71, 40

Second Pass – Second Part:

Move i right while A[i] > pivot and move j left while A[j] < pivot.
When both stop, swap A[i] and A[j] — but only while i < j.

A[i]>pivot
A[j]>pivot
i<j

A[i]<pivot
A[j]>pivot
i<j



A[i]>pivot
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Move i right while A[i] > pivot and move j left while A[j] < pivot.
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A[i]<pivot
A[j]>pivot
i>j

29, 26, 22, 19, 2

Assembling:

60, 55, 71, 40, 33, 29, 26, 22, 19, 2

Questions?

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