

Exercise A

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Problem explanation

- Finding a single value k efficiently in a sorted $N \times N$ matrix (ascending order)
- Considering a search method that has the least elements accessed as its worst case

Solution explanation

- "Ladder" method
 - Idea based on the additional material given during the first week
- Step-by-Step process
 - Comparison of the needed value and elements, starting with the bottom-left element of the matrix
 - Take ***one step up*** if the needed value is less than the current element
 - Take ***one step to the right*** if the needed value is greater than the current element

Solution explanation

- Example:
 - Find $k = 10$

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Solution explanation

- Example:
 - Find $k = 10$
 - $k < 13$
 - Move one step up

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Solution explanation

- Example:
 - Find $k = 10$
 - $k > 9$
 - Move one step to the right

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Solution explanation

- Example:
 - Find $k = 10$
 - $k == 10$
 - k found in matrix

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Solution analysis

- Pros:
 - A flexible step-by-step comparison method
 - Consistent efficiency
 - Similar number of elements accessed for every case
- Cons
 - Possible inefficiency as the number of elements increase

Solution analysis

- Favorable inputs:
 - The inputted value k is located at the bottom-left quadrant of the matrix

Thank you!