

# Problems on Binary Search & Patterns

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### Type 1 (Some ad-hoc Binary Search Problems)

- <https://www.geeksforgeeks.org/order-agnostic-binary-search/>
- <https://leetcode.com/problems/search-insert-position/>
- <https://leetcode.com/problems/search-a-2d-matrix/>
- <https://leetcode.com/problems/sqrtx/>
- <https://leetcode.com/problems/two-sum-ii-input-array-is-sorted/> (IMP)
- <https://leetcode.com/problems/two-sum-less-than-k/>
- <https://www.geeksforgeeks.org/count-numbers-difference-number-digit-sum-greater-specific-value/> (Google Question)
- <https://leetcode.com/problems/median-of-two-sorted-arrays/> (HARD)

### Type 2 (Understanding Lower Bound and Upper Bound)

- Implement lower\_bound and upper\_bound functions of C++ on your own.
- <https://leetcode.com/problems/first-bad-version/>
- <https://leetcode.com/problems/find-first-and-last-position-of-element-in-sorted-array/>
- <https://www.geeksforgeeks.org/ceiling-in-a-sorted-array/>
- <https://leetcode.com/problems/h-index-ii/>

### Type 3 (Find the pivot first , and then search)

N.B - Whenever there is a rotated or a mountain array and we need to search in that array. First find the inflection point i.e the peak element in case of mountain array or min element or pivot in case of rotated array. This makes our search much easier though we have to do two binary searches.

- <https://leetcode.com/problems/find-peak-element/>
- <https://leetcode.com/problems/find-in-mountain-array/>
- <https://leetcode.com/problems/find-minimum-in-rotated-sorted-array/> (Also similar to finding the pivot point where the array was rotated)

- <https://leetcode.com/problems/search-in-rotated-sorted-array/>

#### Type 4 (Binary Search on a row wise sorted Matrix)

- <https://leetcode.com/problems/search-a-2d-matrix-ii/>
- <https://www.geeksforgeeks.org/find-median-row-wise-sorted-matrix/>

#### Type 5 (Minimizing the Maximum or maximizing the minimum)

(Doesn't directly look like a binary search problem)

- <https://leetcode.com/problems/capacity-to-ship-packages-within-d-days/>
- <https://leetcode.com/problems/split-array-largest-sum/>
- <https://leetcode.com/problems/divide-chocolate/>
- <https://www.interviewbit.com/problems/painters-partition-problem/>
- <https://practice.geeksforgeeks.org/problems/allocate-minimum-number-of-pages0937/1/>
- <https://www.spoj.com/problems/AGGRCOW/>
- <https://leetcode.com/problems/minimize-max-distance-to-gas-station/>
- <https://leetcode.com/problems/path-with-minimum-effort/>
- <https://leetcode.com/problems/koko-eating-bananas/>

#### Some things to remember

- While finding mid , always use ,  $lo + (hi - lo) / 2$  , and not  $(hi + lo) / 2$
- Normally Binary Search is done on Arrays , and not LinkedLists.
- Be careful of TLE. (if your implementation is faulty)