

# ICPC Tutorial

Intro. to ICPC, Binary Search, DP, Graphs

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- 1 ICPC
- 2 Binary Search
  - Why?
  - Analysing?
  - Picture is worth a 1000 words!
  - Problems
- 3 Dynamic Programming
- 4 Graphs
- 5 Closing Remarks

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## (What is ICPC?)

General introduction to competition logistics

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Why?

## Linear Search

- Find 37?

0	1	2	3	4	5	6	7	8
20	35	37	40	45	50	51	55	67
↑	↑	↑						
≠	≠	=						

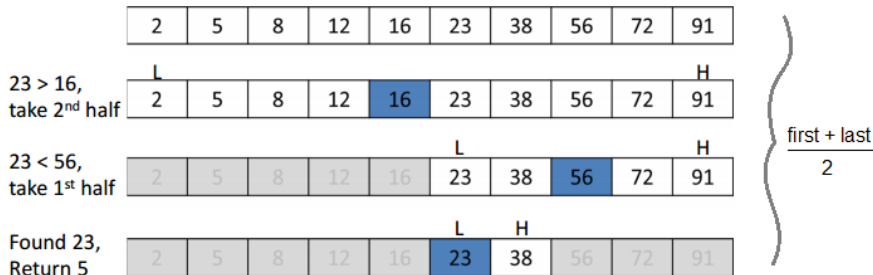
**Return 2**

## (Complexity)

1. Complexity  $\mathcal{O}(n)$
2. Can we exploit the structure of array?
3. Array is Partially Ordered!

# Picture is worth a 1000 words!

If searching for 23 in the 10-element array:



[www.beginnersbook.in](http://www.beginnersbook.in)

## (Complexity)

- Complexity is  $\mathcal{O}(\log_2 n)$ . Intuition how many times can a number be divided by  $k$  -  $\mathcal{O}(\log_k n)$



# Problems

## (Trivial)

- ▶ Find largest element less than a given element
- ▶ Find smallest element greater than a given element

## (Better)

- ▶ AGGRCOW - Aggressive cows
- ▶ C. Mike and Chocolate Thieves
- ▶ Many more - Hackerearth
- ▶ Advanced Concept: Ternary Searches, Parallel Binary Searches

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## (Dynamic Programming a.k.a DP)

- ▶ Brief introduction
- ▶ Problem discussion
- ▶ Ideal Tutorial: Topcoder

## (Comments)

- ▶ Advanced Topics: DP Optimizations
- ▶ Generally easy to code, tough to spot/figure-out state
- ▶ Can be coupled with any algorithm you know - general technique very useful in life: Discussion

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## (Graphs)

- ▶ Most beautiful! personal favourite :)
- ▶ Brief introduction
- ▶ Problem discussion

## (Comments)

- ▶ Very useful! Immense applications!
- ▶ Generally short codes and recursive thinking.
- ▶ Some must know trivia - Traversals, Shortest Paths Algorithms
- ▶ Many advanced topics: Bridges, Articulation Points, Strongly Connected Components(SCC), Heavy-Light Decomposition, Centroid Decomposition, 2-SAT and many-many more.

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# Closing Remarks

- ▶ CP is an art!
- ▶ Don't force it upon. Give time.
- ▶ Don't rush to solution/editorials. Try once more! It's thinking that matters!
- ▶ Make a good team.
- ▶ Speed matters!
- ▶ Everything you need is online!
- ▶ Awesome community! Brilliant people!
- ▶ It helps knowing CP in interview. Helps arrive at efficient solutions quickly.

*Thank You!*  
*Questions?*