

DS221

# Data Structures, Algorithms & Data Science Platforms

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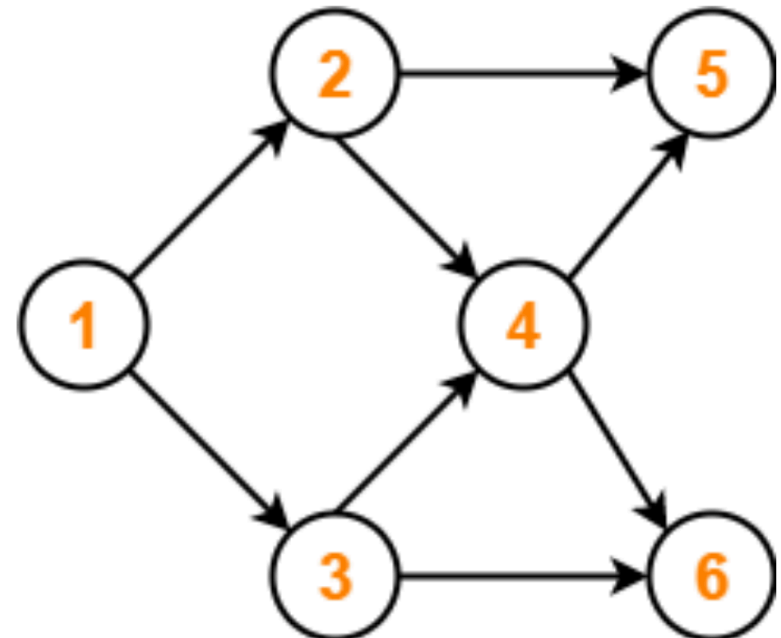
# Exercise 1



# Topological sorting

Topological sorting for Directed Acyclic Graph (DAG) is a linear ordering of vertices such that for every directed edge  $u \rightarrow v$ , vertex  $u$  comes before  $v$  in the ordering.

One possible ordering:  
1 2 3 4 5 6



Application?  
Brute-force algorithm?  
Efficient algorithm?  
Pseudo-code?  
Worst-case runtime?



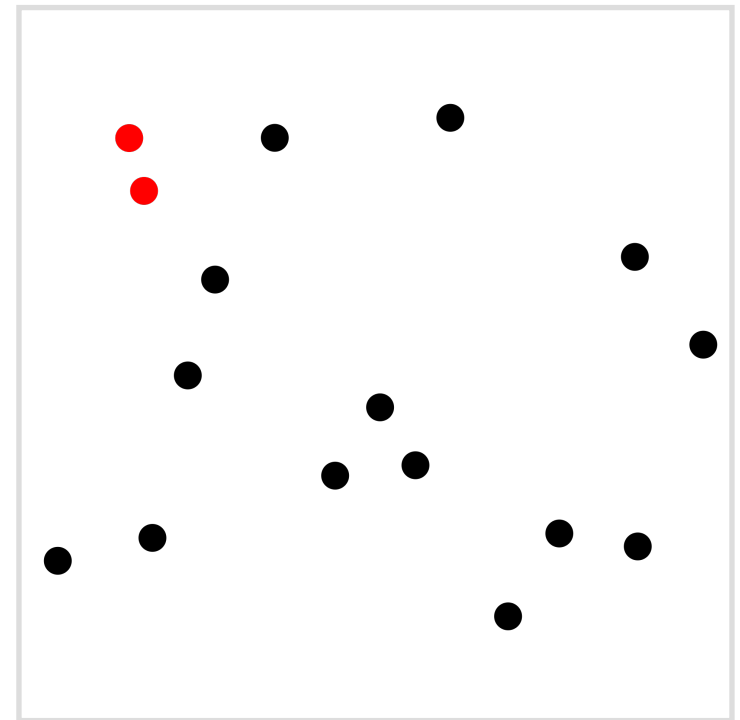
# Exercise 2



# Closest pair of points

Suppose you are given an array of  $n$  points in 2d plane. Find out the closest pair of points in the array.

Application?  
Brute-force algorithm?  
Efficient algorithm?  
Pseudo-code?  
Worst-case runtime?





# Tasks

## ■ Self study

- Given an unsorted list of  $n$  integers, how to compute median in  $O(n)$  time?
  - Reference: <https://www.fundamentalalgorithms.com/s21/notes/divide-and-conquer.pdf> (Section 1)

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### Linear time bounds for median computations

**Authors:** Manuel Blum, Robert W. Floyd, Vaughan Pratt, Ronald L. Rivest,

Robert E. Tarjan [Authors Info & Claims](#)

STOC '72: Proceedings of the fourth annual ACM symposium on Theory of computing • May 1972  
• Pages 119–124 • <https://doi.org/10.1145/800152.804904>