

What does it mean for an algorithm to be efficient?


Find a topological order for the following graph


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How many processors are needed for this example?


Prove that you cannot schedule this set of intervals with two processors


## Who was Dijkstra?

- What were his major contributions?
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Solve by unrolling $T(n)=n+5 T(n / 2)$
$\qquad$



## Subset Sum Problem

- Let $\mathrm{w}_{1}, \ldots, \mathrm{w}_{\mathrm{n}}=\{6,8,9,11,13,16,18,24\}$
- Find a subset that has as large a sum as possible, without exceeding 50


## Knapsack Grid

$\operatorname{Opt}[\mathrm{j}, \mathrm{K}]=\max \left(\mathrm{Opt}[\mathrm{j}-1, \mathrm{~K}], \operatorname{Opt}\left[\mathrm{j}-1, \mathrm{~K}-\mathrm{w}_{\mathrm{j}}\right]+\mathrm{v}_{\mathrm{j}}\right)$


Weights $\{2,4,7,10\}$ Values: $\{3,5,9,16\}$


## How good is this algorithm?

- Is it feasible to compute the LCS of two strings of length 100,000 on a standard desktop PC? Why or why not.

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Find a minimum value cut


## Baseball elimination

- Can the Dinosaurs win the league?
- Remaining games:
- AB, AC, AD, AD, AD, $B C, B C, B C, B D, C D$

|  | W | L |
| :--- | :--- | :--- |
| Ants | 4 | 2 |
| Bees | 4 | 2 |
| Cockroaches | 3 | 3 |
| Dinosaurs | 1 | 5 |

A team wins the league if it has strictly more wins than any other team at the end of the season A team ties for first place if no team has more wins, and there is some other team with the same number of wins


## Complement of a Graph

- Defn: $\mathrm{G}^{\prime}=\left(\mathrm{V}, \mathrm{E}^{\prime}\right)$ is the complement of $G=(V, E)$ if $(u, v)$ is in $E^{\prime}$ iff $(u, v)$ is not in $E$


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Construct the complement \%

## Traveling Salesman Problem

- Given a complete graph with edge weights, determine the shortest tour that includes all of the vertices (visit each vertex exactly once, and get back to the starting point)


