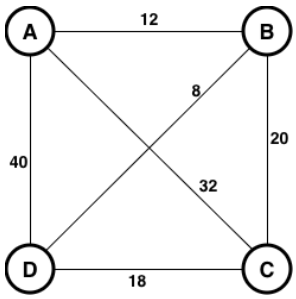
Computer Science 385
Design and Analysis of Algorithms
Siena University
Spring 2026

Exhaustive Search Practice

Exhaustive search to find the the optimal TSP solution for a graph.



Does it matter where we start?

Give all of the orderings for an exhaustive search on the graph.

How many possible tours are there here, where $n = 4$?

How many would there be for $n = 5$? $n = 6$?

In general?

For the Knapsack problem, exhaustive search must consider all subsets of the candidate items. For n items, how many subsets will be considered?

What does this tell us about a lower bound on the cost of an exhaustive search approach to the Knapsack problem?

Given the item weights and values at the right, use an exhaustive search to find the optimal subset of items to place in a knapsack with a capacity of 16 to maximize the value of the items chosen.

item	weight	value
1	2	20
2	5	30
3	10	50
4	5	10

subset	weight	value	subset	weight	value

Use an exhaustive search to find the optimal solution to the assignment problem for the cost matrix given.

	Job 0	Job 1	Job 2	Job 3
Person 0	9	2	7	8
Person 1	6	4	3	7
Person 2	5	8	1	8
Person 3	7	6	9	4

Candidate solutions are permutations of the numbers 1,2,...,n (sound familiar?), where the number in each position indicates job assignment to the person at that position.

How many assignments are possible here?

How many assignments are possible when there are n people and n jobs?