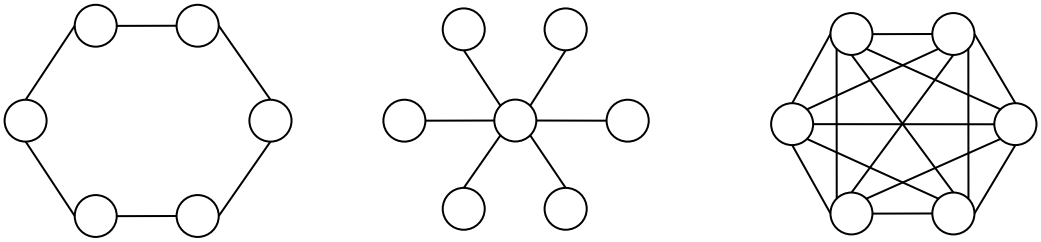
HOMEWORK 2

1. Analyze the complexity of the function `Permutation()` presented in Chapter 3: Brute-force technique (Exhaustive search section).

2. A network topology specifies how computers, printers, and other devices are connected over a network. The figure below illustrates three common topologies of networks: the ring, the star, and the fully connected mesh.



Ring *Star* *Fully connected mesh*

You are given a boolean matrix $G[1..n, 1..n]$, where $n > 3$, which is supposed to be the adjacency matrix of a graph modeling a network with one of these topologies. Your task is to determine which of these three topologies, if any, the matrix represents. Design a brute-force algorithm for this task and indicate its time efficiency class.

3. *Partition problem*: In number theory and computer science, the partition problem is the task of deciding whether a given set S of n positive integers can be partitioned into two subsets S_1 and S_2 such that the sum of the numbers in S_1 equals the sum of the numbers in S_2. Of course, not every set of positive integers has a partition into two subsets with equal sum. Design a brute-force algorithm for this task and indicate its time efficiency class.

4. A magic square of order n is an arrangement of n^2 numbers (from 1 to n^2) in a square, such that the n numbers in all rows, all columns, and both diagonals sum to the same constant t.

   a. Prove that $t = \frac{n(n^2+1)}{2}$

   b. Design a brute-force algorithm to generate all magic squares of order n.