Trees and other Special Classes of Graphs

- Special Classes of Graphs
  - Complete Graphs, Path, Cycle, Star, Wheel, n-Cubes
- Bipartite Graphs
- Trees
  - Characterization of Trees
  - Minimum Spanning Tree
  - Rooted Trees

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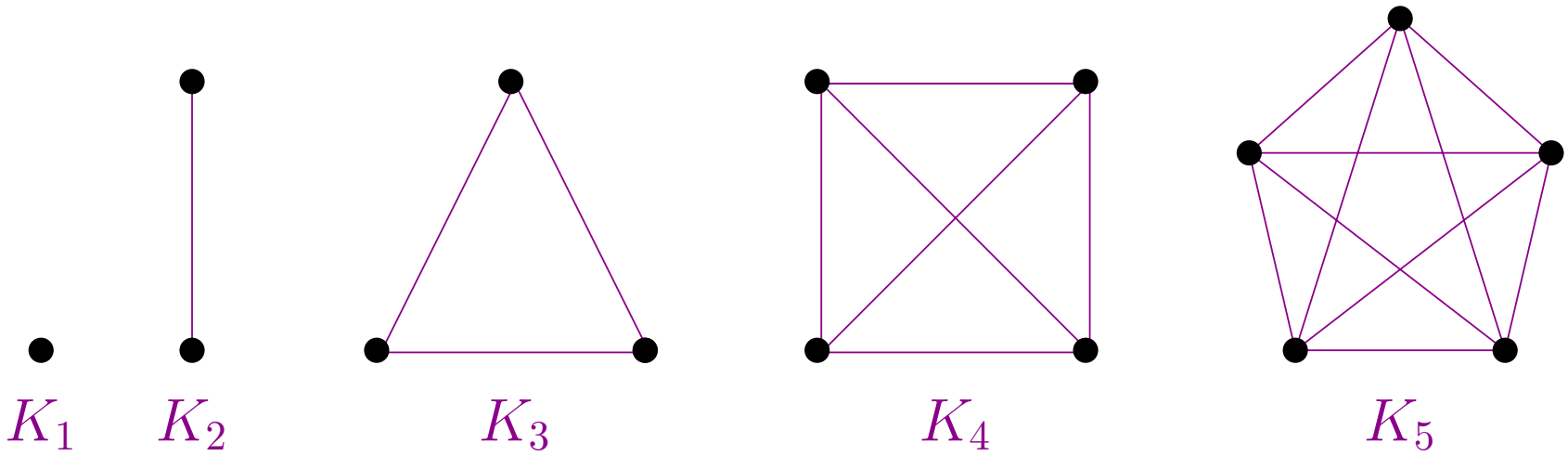
Complete Graph

The **complete graph** is a simple graph containing every possible edge

K_n : the complete graph on n vertices

Degree of every vertex is $n - 1$

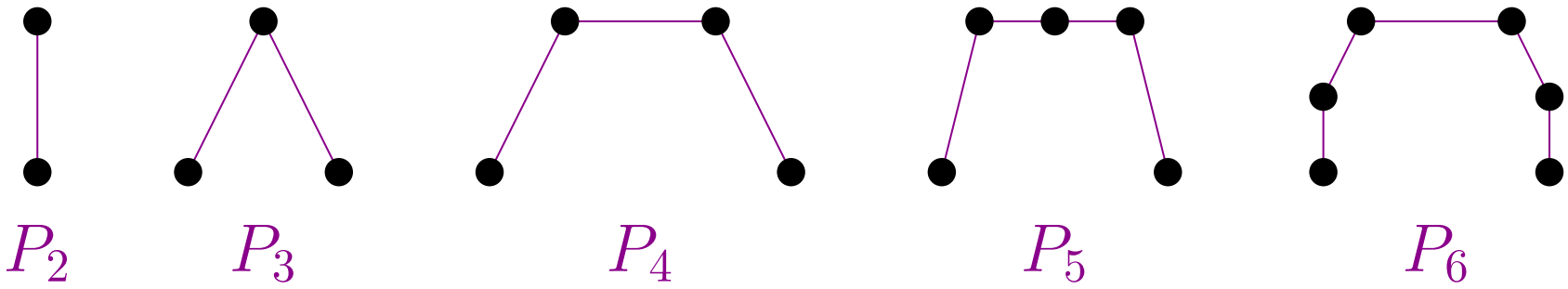


ICP 15-01 How many edges are there in K_n ? $\binom{n}{2}$

Path Graph

The **path graph**, P_n is a path on n vertices

Degree of every vertex is 2 except first and last which are of degree 1

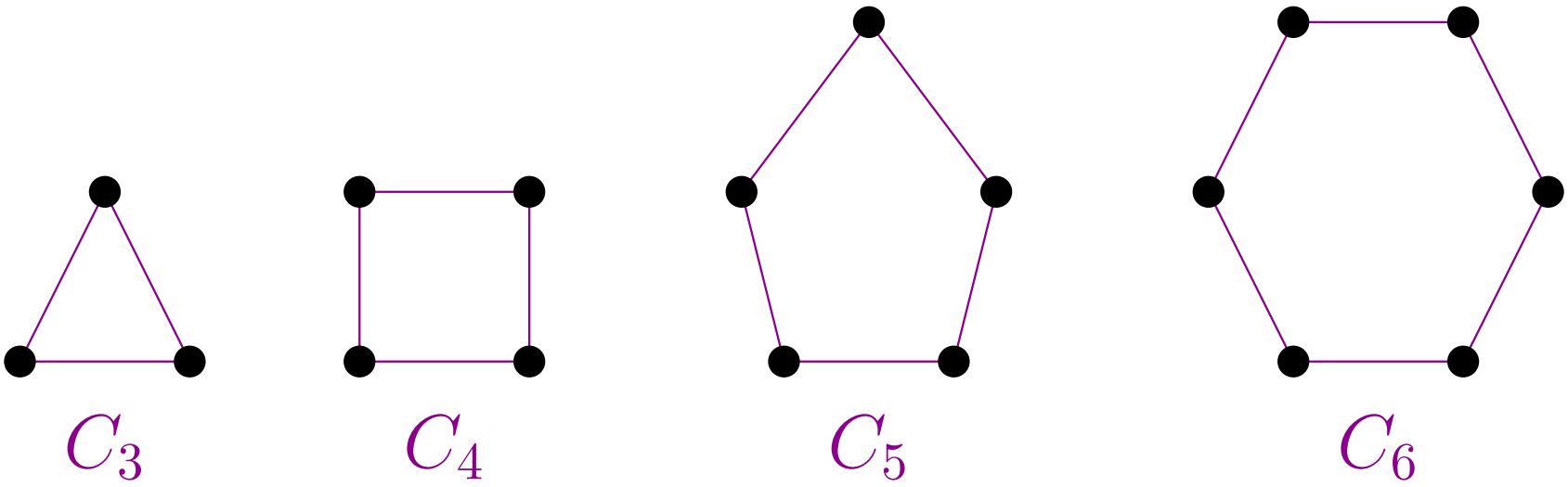


ICP 15-02 How many edges are there in P_n ? $n-1$

Cycle Graph

The **cycle graph**, C_n is the a cycle on n vertices

Degree of every vertex is 2



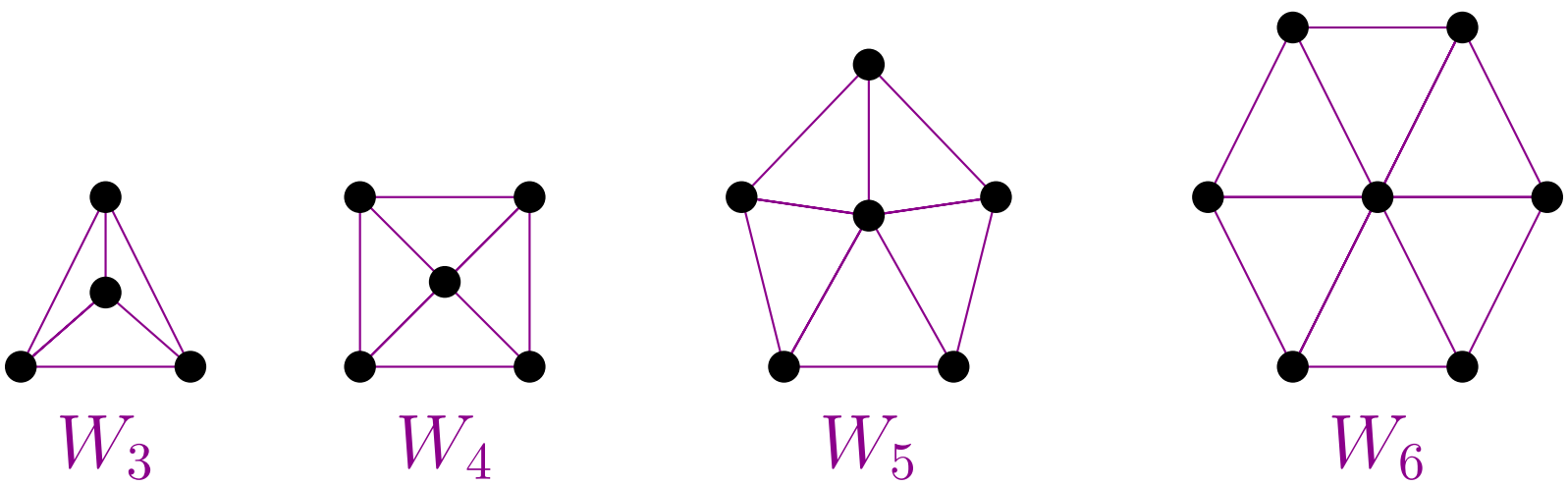
ICP 15-03 How many edges are there in C_n ? n

Wheel Graph

The **wheel**, W_n is obtained from C_n by adding one vertex that is adjacent too all other vertices

Number of vertices in W_n is $n + 1$

Degree of every vertex is 3, except the central one with degree n

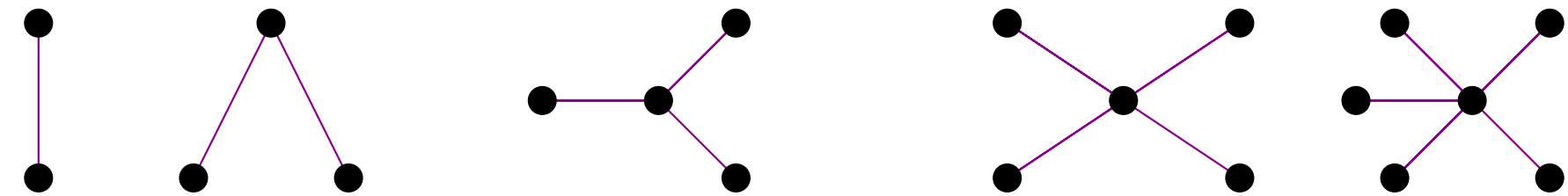


ICP 15-04 How many edges are there in W_n ? $2n$

Star Graph

The **star**, S_n has one vertex (the center of the star) that is adjacent to all other vertices

Degree of every vertex is 1, except the central one with degree $n-1$



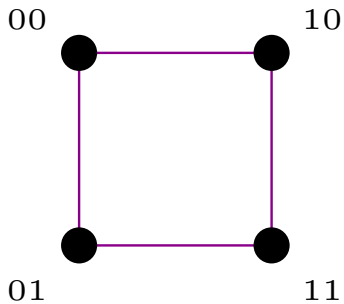
ICP 15-05 How many edges are there in S_n ? $n-1$

n-cube

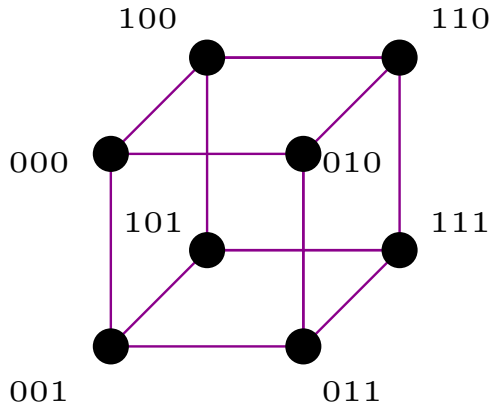
The n-**cube**, Q_n is a graph on 2^n vertices, one for each bit string of length n. Two vertices are adjacent iff their bit strings differ by a single bit

Degree of every vertex is n

Q_1



Q_2



Q_3

ICP 15-06 How many edges are there in Q_n ? $n2^{n-1}$