

Episode 21 – Planar graphs

European section – Season 2

The three houses problem

House 1

House 2

House 3

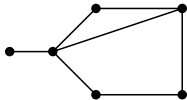
Water

Gas

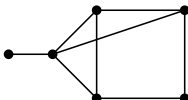
Elec

Planar and plane graphs

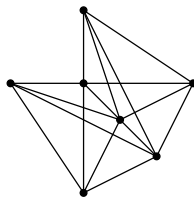
Plane



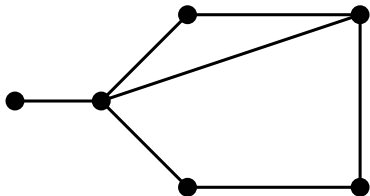
Planar



Non-planar



Regions of the plane



Theorem 1 : Euler's formula

Let G be a connected plane graph with p vertices, q edges and r regions. Then

$$p - q + r = 2.$$

Theorem 2

Let G be a connected plane graph with p vertices, q edges, where $p \geq 3$. Then

$$q \leq 3p - 6.$$