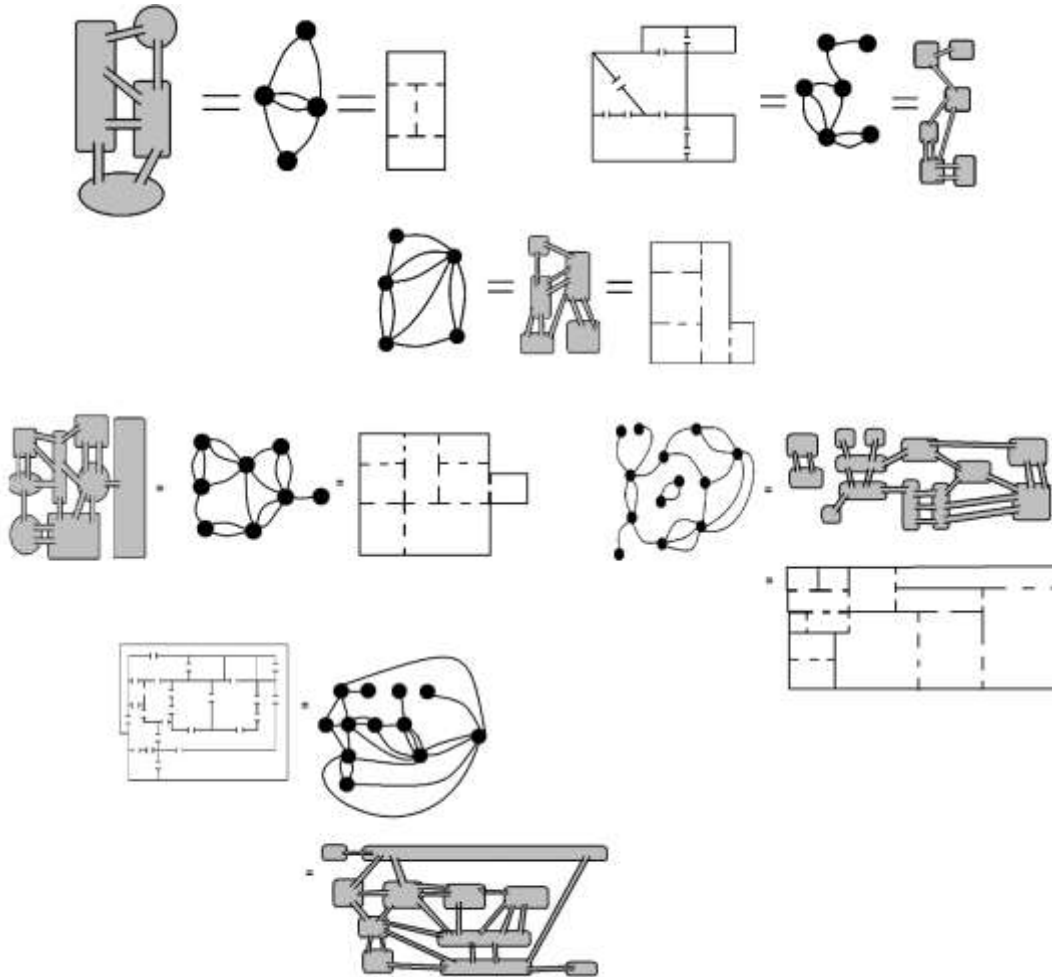


WITHOUT WORDS

Mathematical Puzzles to Confound and Delight



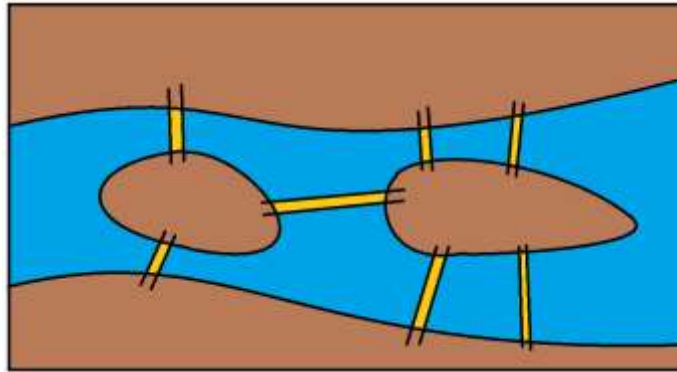
WW 21: SOLUTION



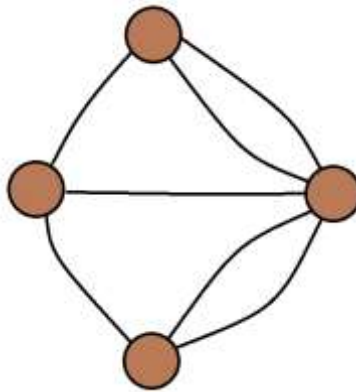
It is often helpful in mathematics to view a given structure from a different perspective. A map of islands and bridges can, for example, be encoded as a diagram of dots and edges (each dot represents an island, each edge a bridge), as can a floor-plan of a house (dots are rooms, edges are doorways between rooms).

Swiss mathematician Leonhard Euler (1707-1783) made powerful use of this approach when analyzing the famous *Seven Bridges of Königsberg* problem.

In the following map, is it possible to walk a path that crosses each end every bridges exactly once?



The city of Königsberg, now Kaliningrad in Russia, was set on two sides of the Pregel River with seven bridges connecting the two mainland masses to two islands. It was said to be a popular pastime for the citizens of the city to attempt to stroll about crossing each bridge exactly once. By drawing a schematic of the map, Euler could argue that such a journey is impossible.



He also developed the general theory that would determine whether or not paths that trace every edge exactly once on such schematic diagrams exist. This spawned a new branch of mathematics today called *graph theory*.