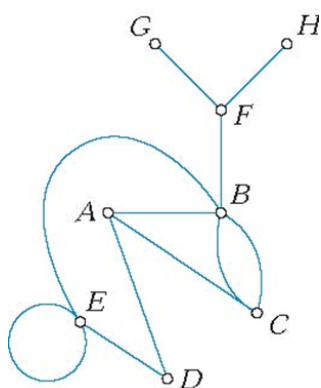


A graph is **connected**, if

A graph that is not connected is said to be **disconnected**.

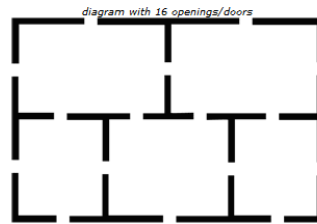
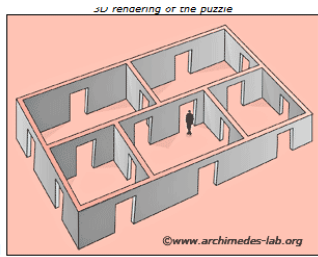
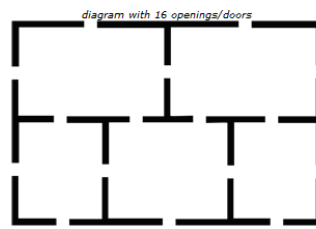
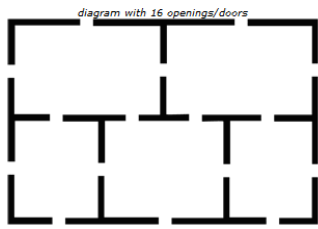
A disconnected graph is made up of separate **components**.

Sometimes in a connected graph there is an edge such that if we were to erase it, the graph would become disconnected—such an edge is called a **bridge**.

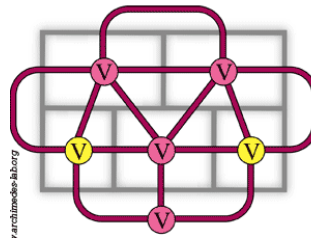


What edges are the bridges in this graph?

5-Room Puzzle: Is there a way to visit every room in this house without using the same door twice?



How is this a graph?



The question becomes....Can you visit every vertex without...

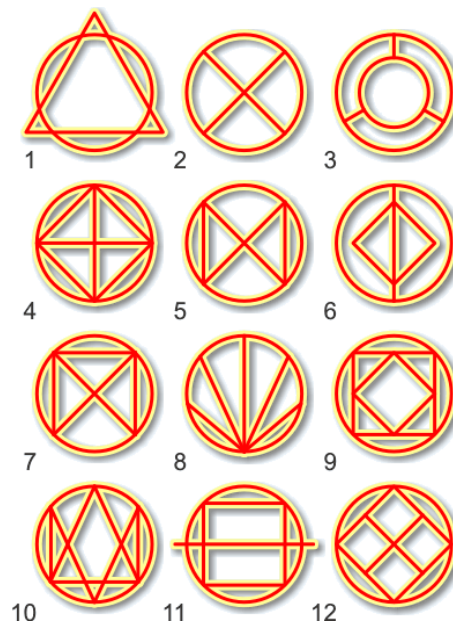
Euler Circuit: A circuit in a graph that crosses every edge exactly once and ends up where it started.

Euler Path:

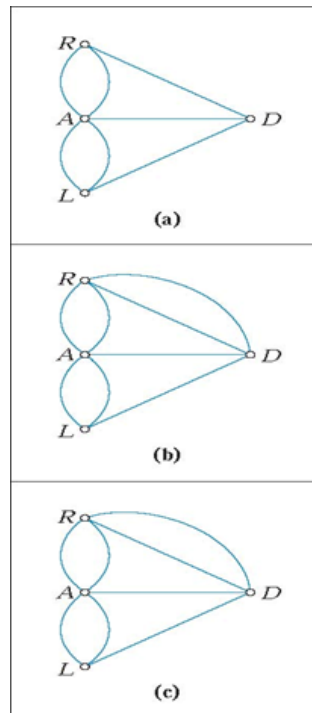
Try to trace out all of the edges of this graph without repeating any edges or lifting your pencil to start someplace new.

A Unicursal Drawing of a graph is one which draws each edge of the graph without going over the same edge twice.

Which of these graphs have one?



An **Euler path** is a path that passes through every edge of a graph *once and only once*. The graph shown in (a) does not have an Euler path; the graph in (b) has several Euler paths. One of them is L,A,R,D,A,R,D,L,A.



<http://www.flashandmath.com/mathlets/discrete/graphtheory/euler.html>



Euler's Circuit Theorem

- If a graph is *connected*, and every vertex is *even*, then it has an Euler circuit (at least one, usually more).
- If a graph has *any* odd vertices, then it does not have an Euler circuit.

Euler's Path Theorem

- If a graph is *connected*, and has exactly *two* odd vertices, then it has an Euler path (at least one, usually more). Any such path must start at one of the odd vertices and end at the other one.
- If a graph has *more than two* odd vertices, then it cannot have an Euler path.

Consider the degrees of the vertices of a graph.

How many odd vertices can a graph have?

How many even vertices can a graph have?

Try some graphs and make a guess.

Attachments



Web Pages as Graphs



Euler Circuit



TheHousesAndUtilitiesCrossingProblem.nbp