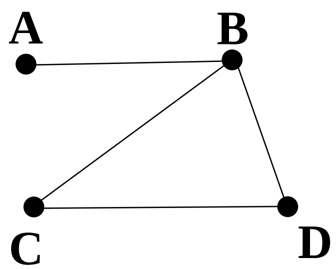
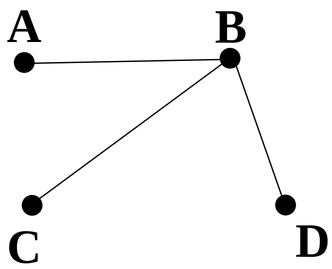
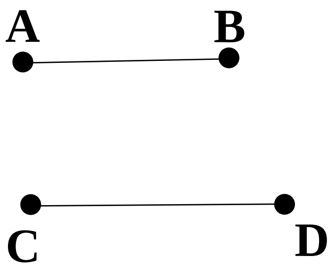
Euler Path:

It’s a path that uses every edge of a graph exactly once.

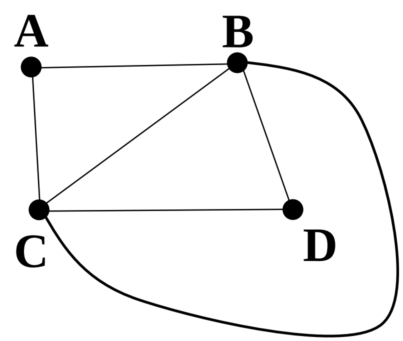


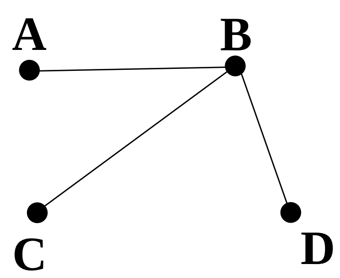




__Euler Circuit:__

It's a circuit that uses every edge of a graph exactly once. Every Euler circuit is also an Euler path.





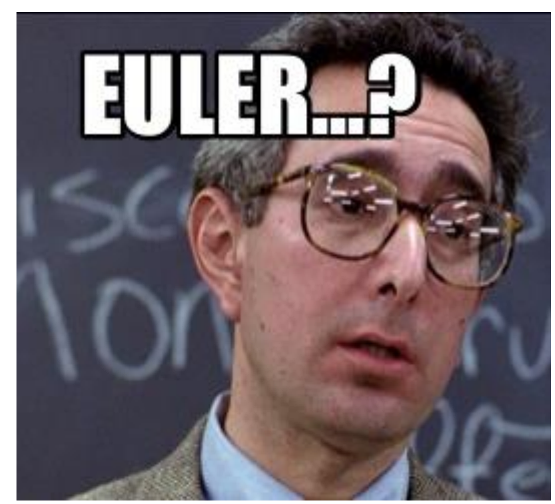
Euler's Theorem:

For a connected graph:

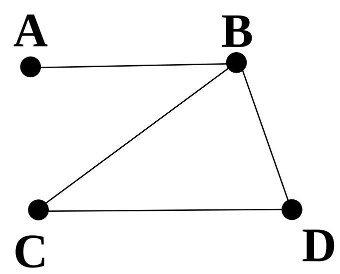
1. **If a graph has exactly two odd vertices, then it has at least one Euler path, but no Euler circuit. Each Euler path must start at one of the odd vertices and end at the other odd vertex.**

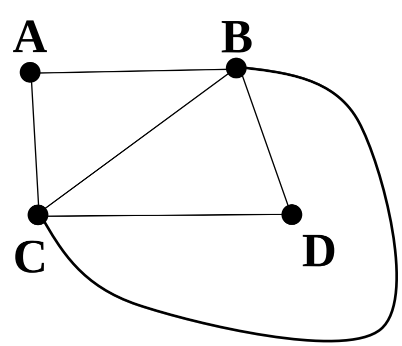
2. **If a graph has no odd vertices, then it has at least one Euler circuit(and therefore an Euler path). An Euler circuit can start and end at any vertex.**

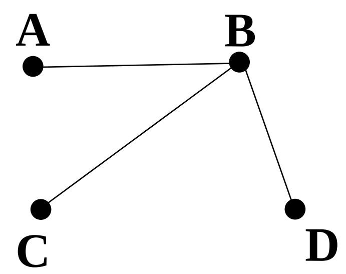
3. **If a graph has more than two odd vertices, then it has no Euler paths and no Euler circuits.**



Determine if the following graphs have an Euler circuit, Euler path, or neither, using Euler's Theorem.







Vertex	Degree
A	21
B	23
C	12
D	14

Vertex	Degree
A	21
B	23
C	11
D	14
E	15

Vertex	Degree
A	22
B	24
C	18
D	14
E	16

How do you find an Euler path or Euler circuit?

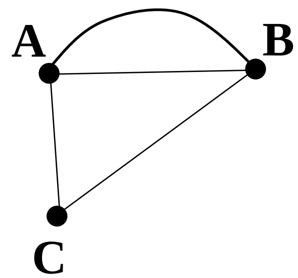
<u>Fleury's Algorithm:</u>

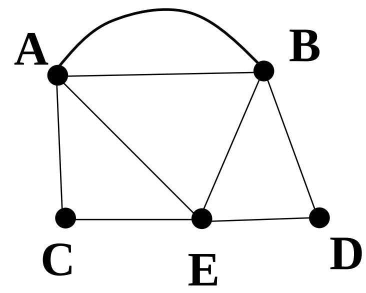
If Euler's Theorem indicates an Euler path or circuit, then

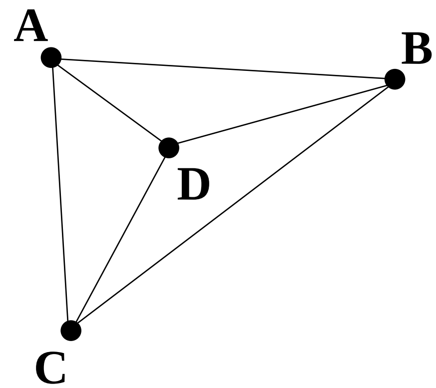
1. **If the graph has exactly two odd vertices(and therefore an Euler path), choose one of them as a starting vertex. If the graph has no odd vertices(and therefore an Euler circuit), start at any vertex.**

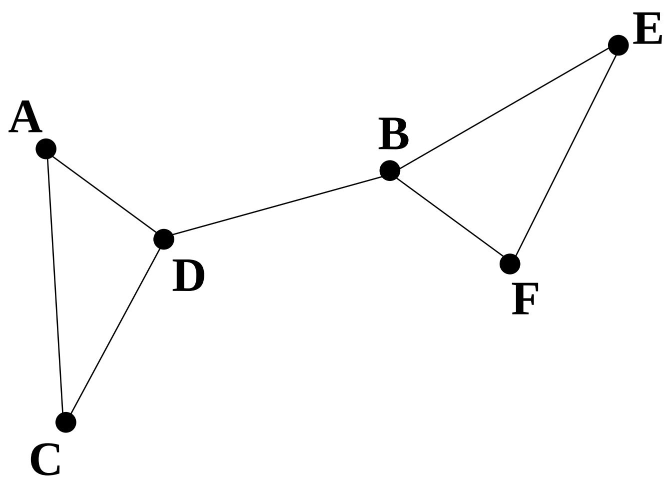
2. **Number the edges as you use them by obeying the following rules:**
    a. **Dash out edges that you have already used.**
    b. **When you have a choice of edges, avoid choosing a bridge, if possible.**

Examples:




A
B
C
E
D


A
B
D
C



A
B
C
D
E
F

Indicate a tour of the building that starts on the outside, passes through each door exactly once and ends in room A.