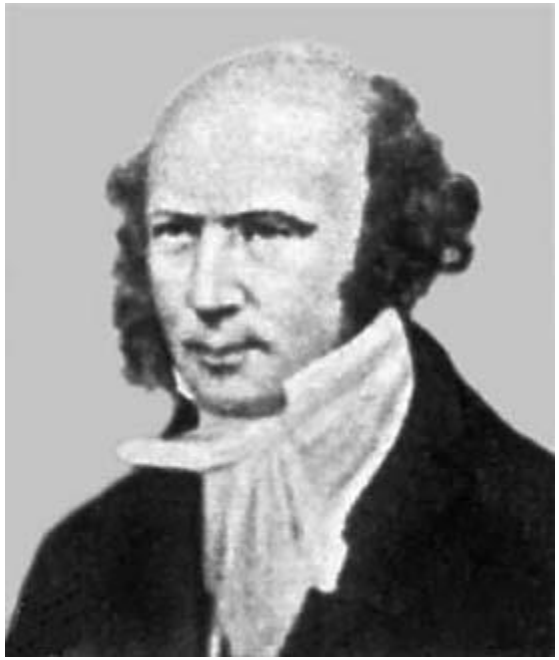
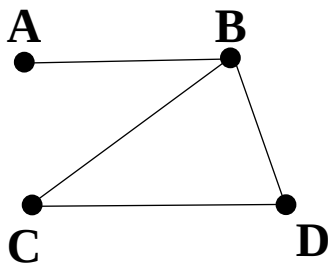
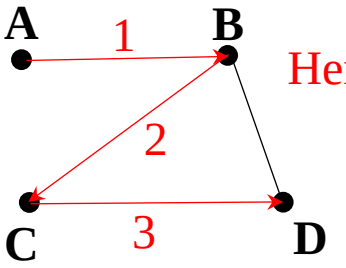
Hamilton Path:

It's a path that visits every vertex of a graph exactly once. It doesn't have to use all the edges.

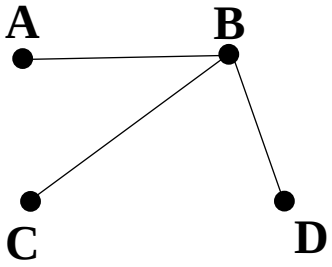






Here is a Hamilton path for the graph above.

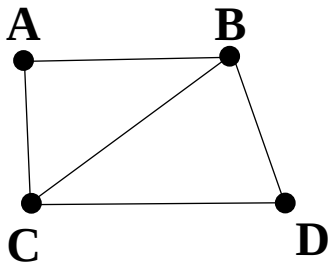
A,B,C,D

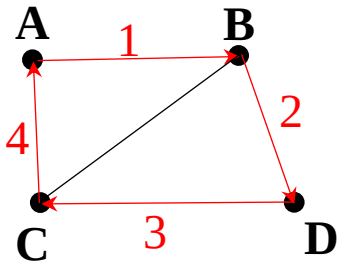


This graph doesn't have a Hamilton path.

Hamilton Circuit:

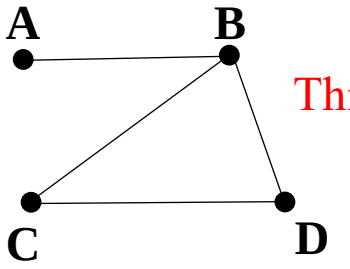
It's a Hamilton path that begins and ends at the same vertex. The starting/ending vertex is the only vertex visited more than once.





Here is a Hamilton circuit for the graph above.

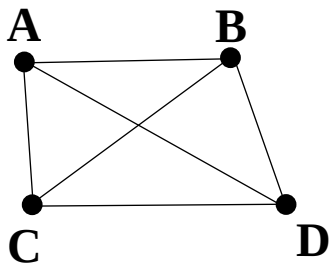
A,B,D,C,A



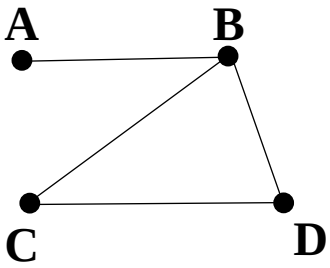
This graph doesn't have a Hamilton circuit.

Complete Graph:

It's a graph in which each pair of vertices is connected by an edge.



This is a complete graph.

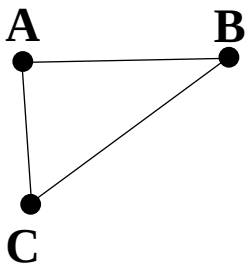


This is not a complete graph because A and C are not connected by an edge and A and D are not connected by an edge.

The theory of Hamilton paths and circuits is not as detailed as with Euler paths and circuits. Here's the main result:

Every complete graph with three or more vertices has a Hamilton circuit.

Example:



Hamilton circuits:

A,B,C,A	**B,C,A,B**	**C,A,B,C**
A,C,B,A	**B,A,C,B**	**C,B,A,C**

But really there are just 2 different Hamilton circuits:

A,B,C,A **and** **A,C,B,A**

clockwise direction its reversal

The textbook will always describe them as starting and stopping at A.

We could have counted them without listing them.

1	2	1	1
1st vertex	**2nd vertex**	**3rd vertex**	**4th vertex**

The product is 2.

Both are vertex A.

In general, a complete graph with *n* vertices has $(n-1)!$ Hamilton circuits.

1	$(n-1)$	$(n-2)$	…	1
1st vertex	**2nd vertex**	**3rd vertex**	…	$(n+1)^{st}$ **vertex**

The product is $(n-1)!$.

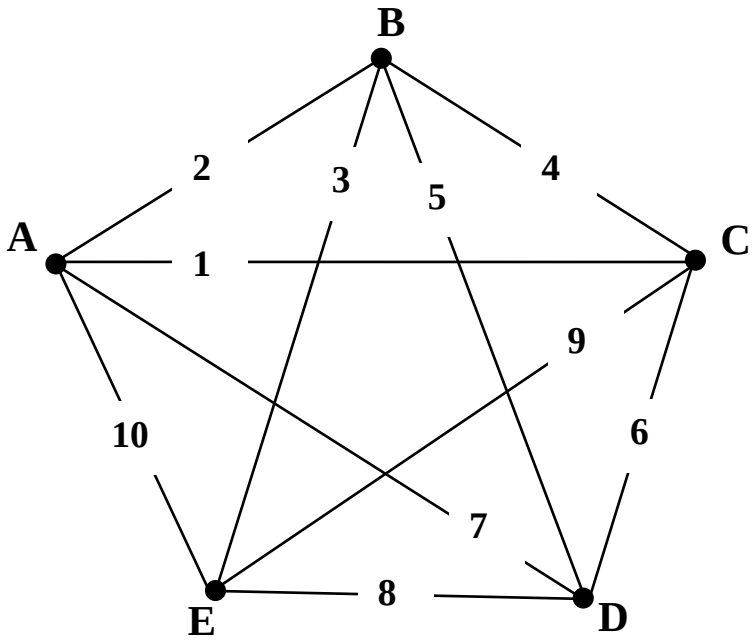
Both are vertex A.

How many Hamilton circuits are in a complete graph with 6 vertices?

$$(6-1)! = 5! = \boxed{120}$$

Weighted Graph:

It's a graph with numbers(weights) attached to its edges. The weights might represent distances, costs, profits,….



Weight of a Path:

It's the sum of the weights of the edges used in the path.

Examples:

Find the weights of the following paths.

A,B,C,D

$2+4+6=\boxed{12}$

B,E,D,C,E

$3+8+6+9=\boxed{26}$

B,E,D,C,A,B

$3+8+6+1+2=\boxed{20}$