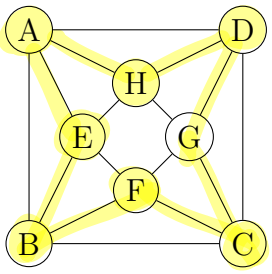
Worksheet 14 (Graph Theory 6): Hamiltonian Circuits

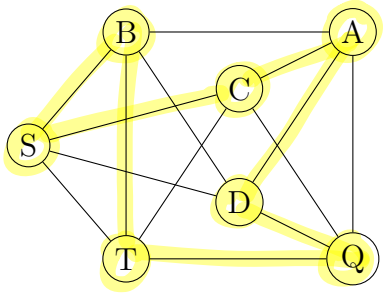
Group Names: Solutions

1. Find a circuit in the following graphs that goes through every vertex exactly once: this is called a *Hamiltonian circuit*. (It does not need to use every edge, of course!)



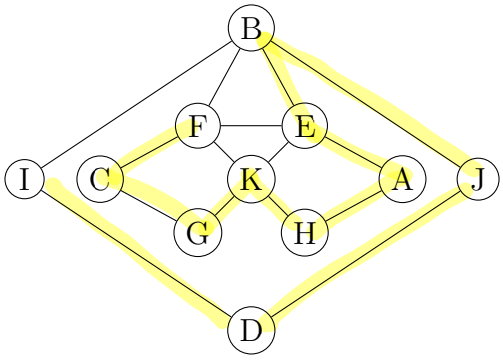
List the vertices in the circuit. A E B F C G D H A

2. Find a Hamiltonian Circuit in the following graph.



List the vertices in the circuit. A C S B T Q D A (lots of possibilities)

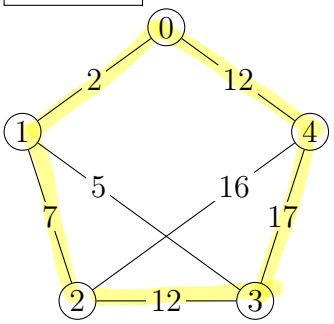
3. Find a Hamiltonian Path starting at vertex I. Then explain why you can't find a Hamiltonian circuit.



The HC has to go through B, I, D, J, so it has to use edges BI, ID, DJ, but then to go from J it has to use JB... and so we can't get to the middle vtx w/o using B twice.

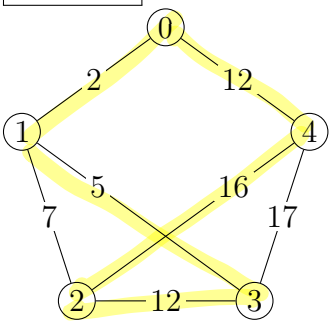
4. The following graph has (up to starting vertex and direction you go around the circuit) two Hamiltonian circuits. Highlight one on each copy of the graph and compute the total weight of the circuit.

Circuit 1



Weight: 50

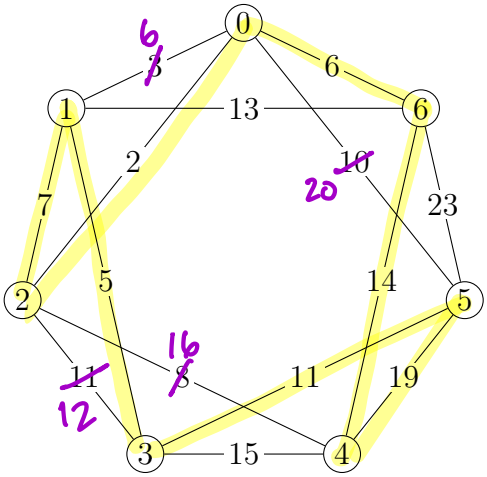
Circuit 2

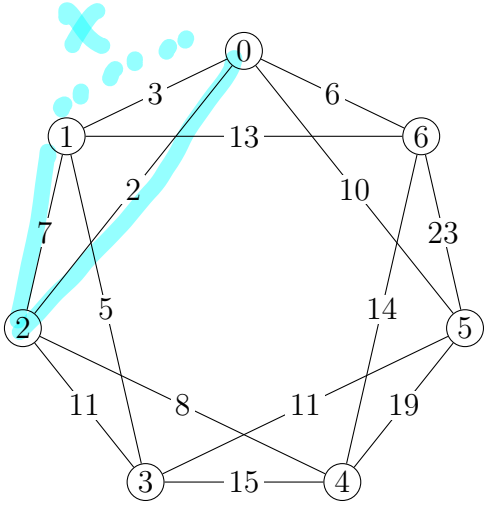


Weight: 47

Which Hamiltonian circuit has the smallest weight? Circuit 2

5. Use the Nearest Neighbor Algorithm starting at vertex 0 to find a Hamiltonian circuit. Highlight the circuit on the left-hand graph.





List the vertices of the circuit in order: 0 2 1 3 5 4 6 0

What is the weight of the circuit you found? 64

~~Bonus: among all Hamiltonian circuits, the circuit with smallest weight has weight 61. Can you find it? Draw it on the second graph.~~

What happens if you try to apply nearest neighbor to the RH graph?

It fails!