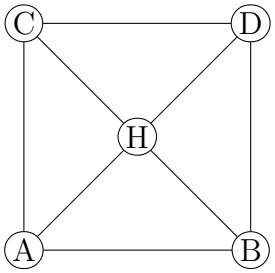
Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many cycle subgraphs (i.e. subgraphs isomorphic to C_n for some n) does the graph below contain? Count two cycles as the same if they have the same set of nodes; don't worry about (for example) which node is the start/end node. Briefly justify and/or show work.



Solution: There are four 3-cycles. There are four 4-cycles that are rotations of CDBHC and one four-cycle that doesn't include the hub H.

There are also either one or four 5-cycles, depending on how you interpreted the criterion about "have the same set of nodes." The issue is that all four rotated verions of CDBHAC have the same set of nodes, but the difference in ordering means that they would normally be considered different subgraphs.

So there are either 10 or 13 cycles.

(2 points) What is the diameter of the above graph?

Solution: 2

(2 points) Does the above graph have a cut edge?

Solution: No

(2 points) How many connected components does the above graph have?

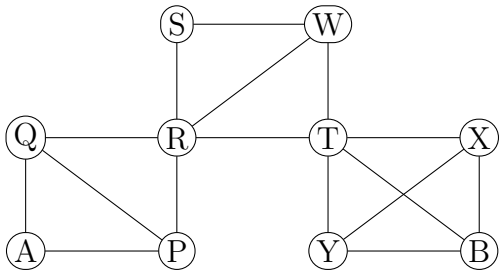
Solution: One

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many paths are there from A to B in the graph below? Explain or show work.



Solution: There are 4 paths from A to R. Then there are 3 paths from R to T. And 5 paths from T to B. So there are $4 \cdot 3 \cdot 5 = 60$ paths total.

(2 points) Does the above graph have an Euler circuit?

Solution: No

(2 points) Is the above graph bipartite?

Solution: No

(2 points) How many connected components does the above graph have?

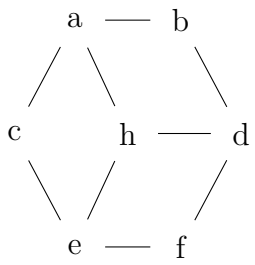
Solution: one

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many paths are there from a to f in the graph below? Explain or show work.



Solution: Paths starting with ab: abdf, abdhef

Paths starting with ac: acef, acehdf

Paths starting with ah: ahdf, ahef

So there are a total of 6 paths from a to f.

(2 points) How many connected components does the above graph have?

Solution: One

(2 points) Is the above graph bipartite?

Solution: Yes

(2 points) Does the above graph contain a 6-node cycle?

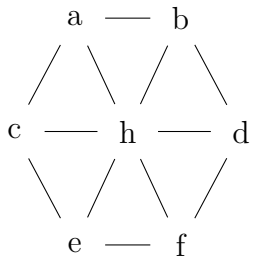
Solution: Yes

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many paths are there from h to d in the graph below? Explain or show work.



Solution: A path from h to d must go from h to one of the rim nodes, then (since it can't return to h) walk along the rim to d. There are 11 possible paths: HD, HBD, HBACEFD, HABD, HACEFD, HCABD, HCEFD, HEFD, HECABD, HFD, HFECAB.

(2 points) Does the above graph have an Euler circuit?

Solution: No

(2 points) Is the above graph bipartite?

Solution: No

(2 points) Does the above graph contain a 6-node cycle?

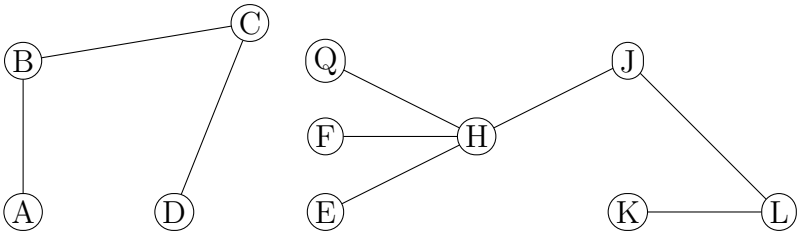
Solution: Yes

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many paths are there (with any starting/ending points) in the graph below? Explain or show work.



Solution: Within each component, every pair of nodes is connected by a path. There are 4 nodes in the lefthand component, so 16 paths. There are 7 nodes in the righthnad component, so 49 paths.

So there are $16 + 49 = 65$ paths total.

(2 points) Is the above graph acyclic?

Solution: Yes

(2 points) How many connected components does the above graph have?

Solution: Two

(2 points) Does the above graph have a cut edge?

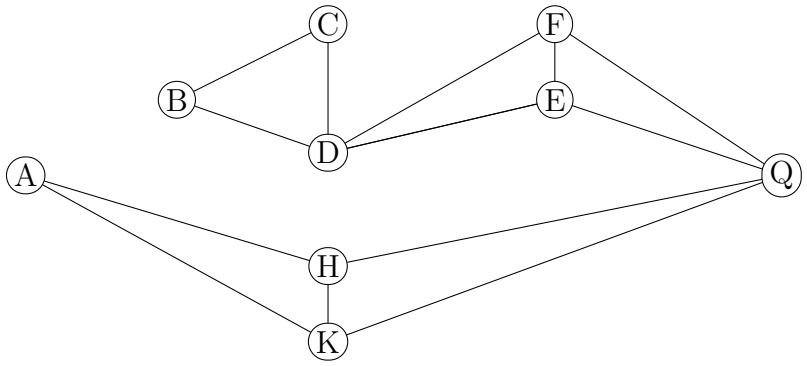
Solution: Yes

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 10 11 12 1 2 3 4 5 6

(9 points) How many paths are there from A to B in the graph below? Explain or show work.



Solution: There are four ways to get from A to Q. Then there are four ways to get from Q to D. And two ways to get from D to B. So a total of $4 \cdot 4 \cdot 2 = 32$ paths.

(2 points) How many connected components does the above graph have?

Solution: One

(2 points) Is the above graph acyclic?

Solution: No

(2 points) Does the above graph have an Euler circuit?

Solution: No