

Name Key

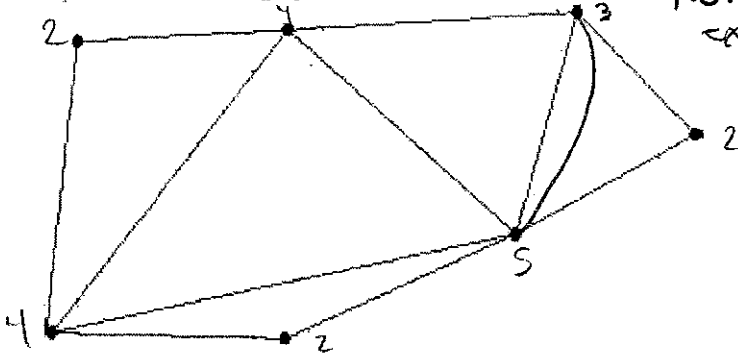
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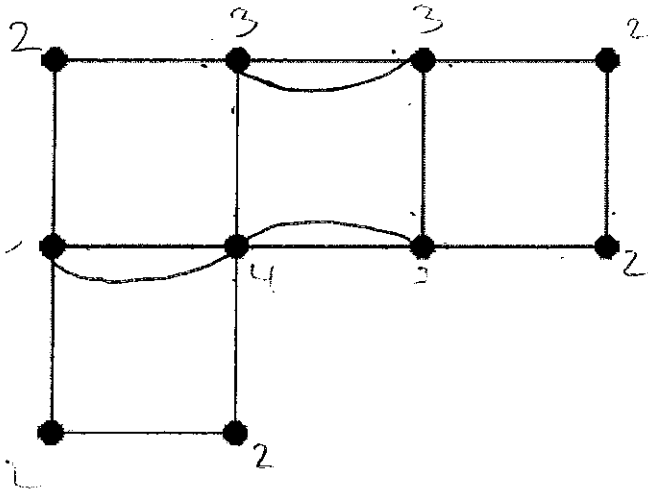
Problem 2. a) State Euler's Theorem. *Even valences and traverses every side once + only once.*

b) Determine if the graph below has an Eulerian Circuit.

No. It is actually an Euler Path. Has exactly two odd valences.



c) Find a good eulerization for the graph below using as few duplicated edges as possible.

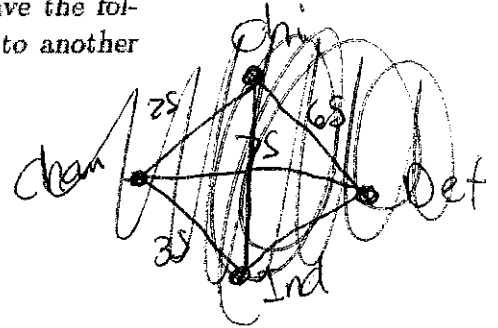
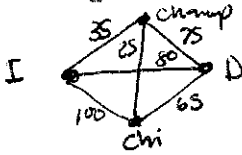


Problem 3. This year Will wants to go to a home Cubs game, a home Bears game, a home Bulls game and watch one of his nephew's soccer games. If there are 81 Cubs games at home, 8 Bears games at home, 41 Bulls games at home and 12 soccer games, how many different ways can Will go to one of each?

Cubs	Bears	Bulls	Nephew
81	8	41	12

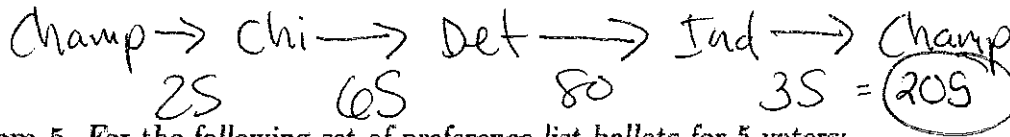
$$81 \cdot 8 \cdot 41 \cdot 12 = 318816$$

Problem 4. You are planning a roadtrip for a group of friends. You are planning on visiting three cities starting from Champaign. You have the following information for how much it will cost to get from one city to another



	Champaign	Chicago	Detroit	Indianapolis
Champaign	0	25	75	35
Chicago	25	0	65	100
Detroit	75	65	0	80
Indianapolis	35	100	80	0

- Draw a weighted graph that models this situation.
- Would a Eulerian or Hamiltonian Circuit be a more appropriate solution for this problem? *Hamiltonian*
- Use the nearest-neighbor algorithm starting at Champaign to plan your trip.



Problem 5. For the following set of preference list ballots for 5 voters:

1 st	A	B	C	D	E
2 nd	B	C	B	C	D
3 rd	E	A	E	A	C
4 th	D	D	D	E	A
5 th	C	E	A	B	B

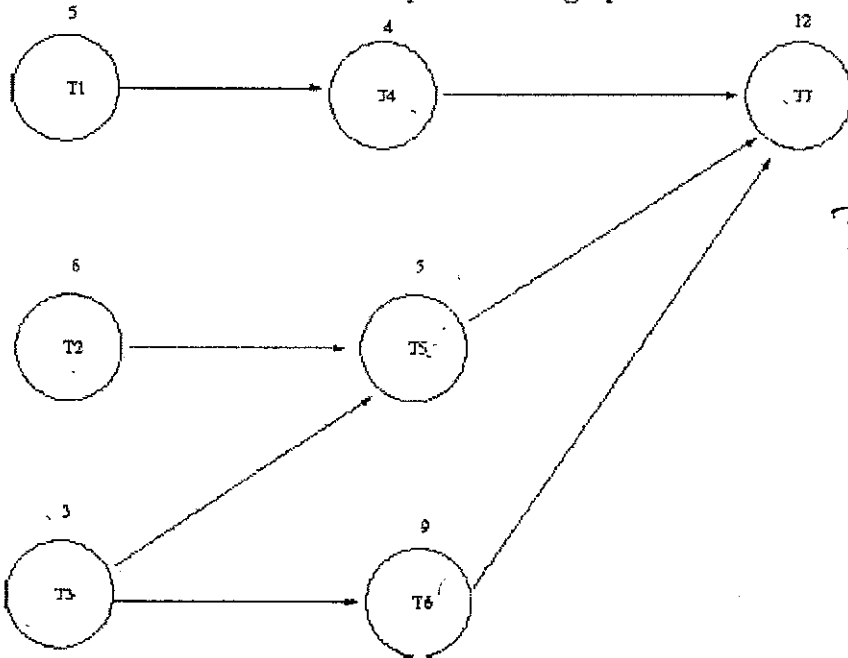
Determine the winner using:

- plurality voting. *Tie*
- the Borda Count. *C*
- the Hare System. *Tie*
- sequential pairwise voting with the agenda *ABCDE*. *C*

Problem 7. Give a description of each voting system and explain the flaw in each.

- Condorcet's Method. *Hard to find everyone*
- Plurality Runoff. *Runoff between the ties, using plurality*
- Borda Count. *points system.*

Problem 8. For the order-requirement digraph below.

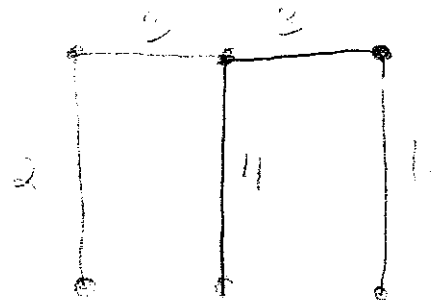
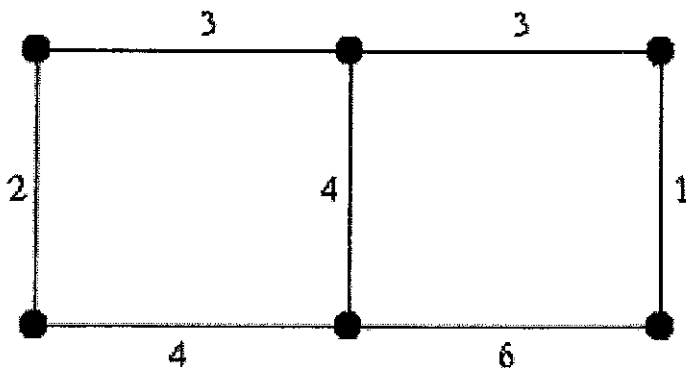


$T_1, T_2, T_3, T_4, T_5, T_6, T_7$

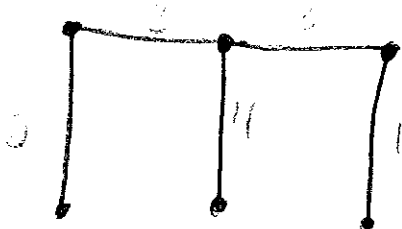
- Which tasks need to be completed before T_7 can be completed? $T_1, T_2, T_3, T_4, T_5, T_6$
- Draw the critical path and indicate how long it is.

$$T_3 \rightarrow T_6 \rightarrow T_7 = 24 \text{ minutes}$$

Problem 9. The power company has just built a new plant. They have to build power lines to connect the plant to several cities. The graph below shows how much it would cost to build power lines.



- What should the power company do to minimize cost? What is the name of this in a graph? Build fewest # of powerlines as possible, while still connecting city.
- Find how the power company can minimize cost and power all the cities. Find minimum cost spanning tree.



Use Kruskal's Algorithm

Name _____

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Problem 10. The Baseball Hall of Fame uses Approval Voting in its elections. Let's imagine that this year there are only 5 voters and 10 candidates. The approval ballots are listed below, an X indicates an approval vote.

Candidate	Voter 1	Voter 2	Voter 3	Voter 4	Voter 5
A	X		X	X	
B	X	X		X	
C		X	X	X	X
D	X				
E	X	X		X	
F		X		X	X
G	X	X	X	X	X
H					X
I	X		X	X	X
J	X			X	X

a) The Hall of Fame requires 75% of the voter for a candidate to enter the Hall.

C, G and I

which candidates will make it?

b) If the Hall were using these ballots to select their "best player of all time," who would they choose?

G