

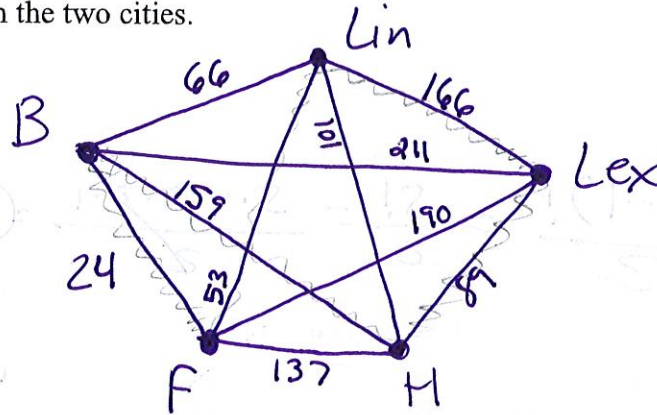
Name Key
 Date _____

CW DAY 10

Suppose you wish to plan a trip, starting in Lincoln, visiting Blair, Fremont, Hastings and Lexington in some order, and then returning to Lincoln. The following is a table of distances between these cities:

	Fremont	Hastings	Lexington	Lincoln
Blair	24 ✓	159 ✓	211 ✓	66 ✓
Fremont		137 ✓	190 ✓	53 ✓
Hastings			89 ✓	101 ✓
Lexington				166 ✓

- A. Draw (neatly) a complete graph with the five cities at the vertices, and label each edge with the distance between the two cities.



- B. How many different trips (circuits) are there (starting and finishing in Lincoln)? Explain.

$$\frac{(5-1)!}{2} = \frac{4!}{2} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{2} = 12$$

- C. Use the nearest-neighbor algorithm starting at Lincoln, and the sorted edges algorithm to find Hamiltonian circuits for your trip.

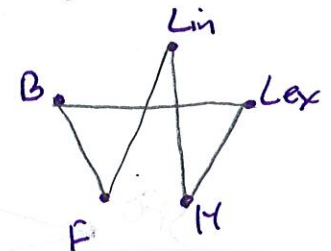
NN

Lin - F - B - H - Lex - Lin

$$53 + 24 + 159 + 89 + 166$$

491

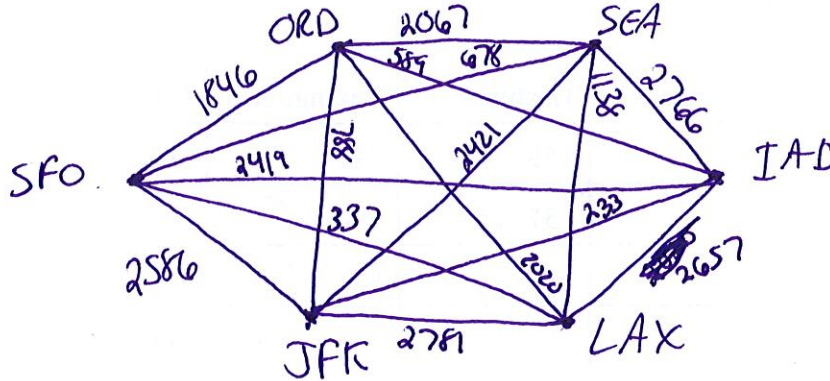
- SE
- FB = 24 ✓
 - Lin-F = 53 ✓
 - Lin-B = 66 ✗
 - Hlex = 89 ✓
 - Lin-H = 101 ✓
 - HF = 137 ✗
 - HB = 159 ✗
 - Lex-Lin = 166 ✗
 - Lex-F = 190 ✗
 - Blair-Lex = 211 ✓



$$24 + 53 + 89 + 101 + 211$$

478

1. Draw a complete graph of the following six airports: SFO, ORD, SEA, IAD, LAX, JFK



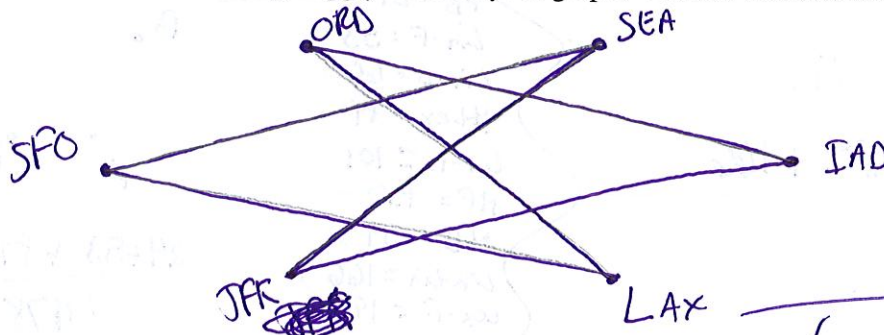
2. How many distinct Hamiltonian Circuits can be found between the 6 cities? Show how you got your answer.

$$\frac{(6-1)!}{2} = \frac{5!}{2} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2} = 60$$

3. Add weights to your graph using the following distances.

SFO - JFK	2586	LAX - ORD	2020 ✓
SFO - IAD	2419 ✗	LAX - IAD	2657
SFO - SEA	678 ✓	LAX - JFK	2781
SFO - ORD	1846 ✗	ORD - IAD	589 ✓
SFO - LAX	337 ✓	ORD - JFK	788 ✗
SEA - LAX	1138 ✗	IAD - JFK	233 ✓
SEA - ORD	2067 ✗		
SEA - IAD	2766		
SEA - JFK	2421 ✓		

4. Using the Sorted Edges Algorithm, find the minimum-cost Hamiltonian Circuit between the cities. Show the circuit using wiggly lines on your graph. What is the minimum cost?



$$233 + 337 + 589 + 678 + 2020 + 2421 = 6278 \text{ miles}$$