Presentation 1. Due by March 9. Outline due by Feb. 9, 2018

You must present on a linear programming problem. See below for suggested list.

Outline/Checklist for presentation: Each part should be only about one or two slides, around 2 minutes.

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1) Describe the applied problem, as in "finding the shortest tour of n cities with symmetric distances."

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2) Define the math model, as in "find the minimum weight Hamiltonian cycle on edge-weighted K_n."

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3) Give an example problem for small n, probably n=4 or 5.

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4) Describe the polytope that allows a linear programming approach. Define the vertices. Define the objective function (vector).

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5) Show the vectors: vertices and objective; for your small example.

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6) Explain some known facts (dimension, # of vertices, facets) about the polytope for other values of n, or other situations (different graphs or input sets.)

Groupwork: If you want to work as a team of two people, then there are two additional points that must be added to your presentation/outline/checklist. Then you must each present four of the eight points:

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7) Explain and use a greedy algorithm to solve your example problem.

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8) Explain and use facet inequalities and an LP solver to solve your example problem.

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Outline due by Feb. 9: Give a brief, one sentence summary for the above 6 or 8 items. You may include terms that you don't understand completely yet. Make sure you list which parts will be presented by which partner if you plan to work as a team. Also give three (3) dates on which you would like to do your presentation. (Tues Thurs, between Feb 20 and March 8).

40 points total, worth 15% of grade.

Many polytopes and problems are summarized, with sources, here:
http://www.math.uakron.edu/~sf34/hedra.htm (The Associahedra Encyclopedia)

Problem	Polytope
Optimal asymmetric tour	Asymmetric Traveling salesman polytope (n)
Optimal weak order	Weak order polytope (n)
Maximum bipartite subgraph	Bipartite Subgraph polytope (n)
Optimal perfect matching	Birkhoff polytope (n)
Minimum Cut	Cut Polytope (n)
Most efficient binary code	Huffman Polytope (n)
Optimal linear order	Linear Ordering Polytope (n)
Optimal committee selection	Linear signed order polytope (n)
Optimal partial order	Partial order polytope (n)
Balanced minimal evolution tree	Balanced Minimal Evolution Polytope (n)
Minimize size of set cover	Set covering polytope (S,T)
Minimize vertex covering	Vertex covering polytope (G)
Maximum stable set (independent set) of nodes.	Stable set polytope (G)
Maximum acyclic subgraph	Acyclic subgraph polytope (n)
Optimal transport	Transportation polytope (M)
Optimal packing	Knapsack polytope
Scheduling	Generalized Permutahedron
Interval graph completion	Interval order polytope