TCSS 343 - Week 10

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Final Review

"Behind every argument is someone's ignorance."
$\cdots$
Louis Brandeis

"The fastest algorithm can frequently be replaced by one that is almost as
fast and much easier to understand"
$\cdots$
Douglas W. Jones

Given an even number of coins in a row of arbitrary denominations, two players take turns taking a coin from either end. Winner is who gets the most cash. Player 1 goes first. 0. Would you rather go first or second? Does it matter?

1. Assume that you go first, describe an algorithm to compute the maximum amount of money you can win with tidy input and output conditions. (HINT: If you go first, is there a strategy you can follow which prevents you from losing? Try to consider how it matters when the number of coins are odd vs. even.)

Course ID:	TCSS 440	TCSS 445	TCSS 450	TCSS 456	TCSS 487	TCSS 491	TCSS 372	TCSS 343
Starts At:	8:15 am	9 am	9:45 am	11 am	12 pm	1:15 pm	1:45 pm	2 pm
Ends At:	10 am	11 am	10:45 pm	12:15 pm	2 pm	2 pm	3:45 pm	4 pm

The Institute of Technology of UW Tacoma will offer eight courses and seminar cycles during the Summer quarter. Their starting and ending times cannot be changed, and are given in the following table:

Using the Interval Scheduling algorithm, determine:

2. The maximum number of courses/seminars that can share one single classroom.

3. The minimum number of classrooms needed to accommodate all these courses/seminars.

4. A suitable assignment of classrooms to courses/seminars matching the constraints found in the previous items.

Al Gore-*ithm* has become concerned about global warming and has decided to modify his energy consumption in order to minimize the amount of carbon dioxide (CO_2) produced. There are three electricity providers in his area, but all three providers, depending on seasonal weather and various other factors, change their electricity generating methods from week-to-week. Thus, for some weeks of the year company A might produce less CO_2 and for other weeks companies B or C might produce less CO_2. Al would like to switch providers each week to make use of the one that produces the least CO_2, but switching creates extra CO_2 (e.g., the companies have to send trucks out to his house).

Here's an example using just two companies. Suppose that changing providers costs 40 units of CO_2 and that, over two weeks, using company A will cause the release 130 and 77 units of CO_2 while using company B will cause release of 85 and 101 units of CO_2. If we use company B for the first week and then change to company A for the second week then the total released is $85 + 77 + 40 = 202$. If we stay with company B for the whole two weeks then the total released is $85 + 101 = 186$.

5. So here's the problem: We have lists, a_1, a_2, ..., a_n and b_1, b_2, ..., b_n and c_1, c_2, ..., c_n, of CO_2 amounts over n weeks for companies A, B, and C, respectively. We also know p, the amount of CO_2 released due to changing providers. Give an algorithm to determine which provider to use for each week so that total CO_2 released is minimized.

6. Suppose that company A has switched to trucks that burn only bio-fuels. Now the amount of CO_2 released when switching to company A is reduced (but the switch-over cost remains the same for the other companies). Briefly explain how your algorithm should be changed to reflect this new information.

For each of the following statements, respond *True*, *False*, or *Unknown*

7. P = NP

8. If a problem is NP-Complete then it is NP-Hard.

9. No problem in NP can be solved in polynomial time.

A. If there is a polynomial time algorithm to solve problem A then A is in P.

B. If there is a polynomial time algorithm to solve problem A then A is in NP.