Example Project Proposals

The following set of three project proposal examples has been designed to give you a sense of the length, format, and content coverage that we expect in the project proposal. We have chosen Problems 3, 4, and 5 on the diagnostic as examples of viable final project ideas (that is, they are very much in scope of the type and difficulty of problems that we might expect students to tackle in the final project). Here are three project proposals that correspond to each of these final project ideas.

Example 1 (ADTs)

[90 words]
Concept area: ADTs and implementation of a real-world algorithm

Students will be asked to model/implement a video compression algorithm that I recently learned about, which operates on frames of a video and produces a more space-efficient representation that can be transmitted across a network. Grids of integers will be used to represent the video data frames, and students will implement a pixel-difference-based algorithm that stores a compact representation of pixel differences between frames. A rough example of the function prototype that a student would be asked to implement is:

```
CompressedDataStructure compressVideosFrames(Grid<int> frame1,
                           Grid<int> frame2)
```

Example 2 (Recursion)

[92 words]
Concept area: Recursive Problem Solving

My problem implements a function that simulates a tournament or competition among a number of different Pokémon – the motivation would be to try to find the "best" Pokémon to be used in battle. The tournament will have a recursive tree-like structure where winners at each level continue to play each other until only one winner remains. I will likely store the original starting list of Pokémon for the tournament as a Vector, and each individual Pokémon will be represented as a string. Here's a rough function prototype:

```
string findWinnerOfTournament(Vector<string> pokemon)
```

Example 3 (Backtracking)

[98 words]
Concept area: Recursive backtracking and Maps

The general idea behind my problem is that students will be asked to implement a function that searches a social network (representing professional connections) to find employees/colleagues that are a certain "distance" away from one another. Such a tool could be used to help in hiring processes when looking for professional references for a potential new hire. I would use a map data structure to represent the association between each person and their connections. Then, students will implement a DFS-style algorithm with a distance constraint to search this network. Function prototype:

```
bool connectionInNetworkExists(Map<KeyType, ValueType> network, int
          maxDistance, string person1, string person2)
```