THE MUDDY CITY

• Our society is linked by many networks: telephone, utilities, roads
• For a particular network, there is usually some choice about where the links can be placed.
• This exercise examines a complete network to determine the links necessary to connect all the components of the network at minimal cost.
THE MUDDY CITY

a graph
This exercise illustrates how to build what we call the “minimal spanning tree”.
- A tree does not have any cycles where you can get back to where you were before.
- This exercise does **not** give us the shortest path from one location to another.
  - But there is another algorithm for that!
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• Many optimization problems involve situations where certain events cannot occur at the same time (e.g. scheduling meetings and classes).
• Coloring regions of a map with different colors is effectively the same problem as we will show in this exercise.

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• Given a map, color each region with a color so that no two adjacent regions use the same color.
• If two region touch only at one point, they are not considered adjacent.
  ▪ Example: Arizona and Colorado
• How many colors are sufficient to color a map?
• How many colors are necessary to color a map?
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The conjecture that any map can be colored using only four colors was formulated in 1852 but was not proven until 1976 with the help of a computer!

A real application: Scheduling Exams – A link (edge) exists if at least one student is taking both courses. How many exam slots do we need for no conflicts?
Computer programs often need to process a sequence of symbols such as words in a document or even the text of another program. Computer scientists use a Finite State Automaton (FSA), a set of instructions to see if the sequence is acceptable or not. This exercise uses the FSA idea using treasure maps!

Goal: Find Treasure Island, starting from Pirates' Island. Friendly pirate ships sail along fixed routes between islands offering rides to travelers. Each island has two departing ships, A and B. Determine all possible sequences of ships that a traveler can take to arrive at Treasure Island. Use your map to record all the ship routes.
What is the quickest route?

"directed graph"

The teacher's version of Computer Science Unplugged is available online at

http://www.csunplugged.org

- The book is FREE to download and use!
- Additional material will be published soon to add even more activities, including video to demonstrate how to use these activities effectively in your classroom.