Study Guide for Midterm 2 USU 1360

This NOT meant to be all inclusive. It will grow as we cover more in class. Consult the webpage for notes and links to CSILM exercises.

You will NOT be tested on Alice. You will show your Alice skills in inclass exercises, homework exercises, questions during lecture, and on the final project rather than on this exam.

1. What does the term "integrative physical science" imply?
2. What is the scientific method?
3. Why do we create a mathematical model of a real world problem?
4. In doing online research, how do you identify a factual page?
5. Use the principles of "estimating the number of 3 letter words" to estimate the number of dentists in Utah.
6. In general, why do I estimate rather than use actual values?
7. What is the law of large numbers and how does it apply to estimation?
8. What is the motivation for counting such things as the following: A standard deck of playing cards has 13 spades. How many ways can these 13 spades be arranged? What is the answer?
9. How is a tree model used in enumerating possibilities? How could it be used in the "counterfeit coin" problem?
10. What is a graph in computer science? Give an example of a problem that is modeled with a graph. Explain the model.
11. Explain each step of the modeling process
   1. Analyze the problem. Understand fundamental questions
   2. Formulate a model
   3. Implement the model
   4. Verify and interpret the model’s solution
   5. Report
12. When you estimated area by a grid system, where was the error introduced? How could it be reduced?
13. Color this graph in the minimal number of colors. Give an example of a real life problem one would solve with graph coloring.
14. What is recursion? Give a real life problem that is recursive.
15. Consider this algorithm for alphabetizing nametags. Is it a good one? How would you decide?
16. The following table shows number of moves from the tower of Hanoi problem. Can you describe how the problem grows with the number of disks?
17. Give an example of an algorithm you use in real life.
18. List the five essential properties of an algorithm.
19. List an example of an ambiguous phrase in English.
20. There are three kinds of sequence control: sequential, conditional, loop. Give a USEFUL algorithm which uses all three kinds of sequence control.
21. The picture of sluggo looks like it goes forever. In programming, why doesn’t a recursive solution go forever?
22. Given the following string, show the results of LZW compression.
23. What are the characteristics of a good compression algorithm?
24. What is the "time/space" tradeoff? Give an example.
25. How are characters encoded? If I have 8 bits, how many characters can I encode? If I use 16 bits? Why would anyone ever want to use 16 bits for a character code?
26. How can I compress an image? What are the negatives to doing so? Does compressing a movie offer any new ways of compression?

Terms:
- model
- probabilistic or stochastic
- Deterministic
- Static/Dynamic model
- algorithm
- natural language/formal language
- ambiguity
- compression
- lossless/lossy
- adaptive
- time/space trade-off
- fully saturated
- dictionary (in data structure terminology)
- pixel
- frequency
- force/intensity
- sampling rate
- Nyquist rule
- HZ
- bits per sample